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Motor Age

Vol. II. No. 22 NOVEMBER 27, 1902 5 Cents

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M M

(THE WHEEL THAT'S TRUE!) "Let another man praise thee"—*Proverb xxii, 2.*

We this week allow some people who know something about **MIDGLEY TUBULAR STEEL WHEELS** to do a little talking for us

With the advent of the Automobile the demand for many new departures from old lines has been felt, and apart from the motive force, no part is of more importance than the foundation of your machine, "the Wheels," for on their reliability may depend your life. Below we enumerate a few instances which show the strength of the "Midgley Wheel" when occasion arises:

Midgley Manufacturing Company:

Gentlemen—No doubt you will be interested in hearing of my experience with your steel wheels. I put a set of your steel wheels on my machine, which weighs about 1,200 pounds, more than a year ago, and since that time have run over 5,000 miles on them. During this time I had a number of accidents, which I have every reason to believe would have been serious if it had not been for the great strength of these wheels. Like every one who runs an automobile, I have had more or less trouble from skidding on wet pavements, and have a number of times skidded into the curbstone violently, but without damaging these wheels or the machine in the least. At one time, when running on a wet asphalt pavement, the machine skidded immediately in front of a street car. The front of the car struck one of the rear wheels of my machine at an angle, shoving the machine off the track. As the car passed, the journal box on the car again caught the edge of the hind wheel with such force that it turned the automobile almost entirely around. Upon getting out and examining what damage had been done I could find no other damage except a slight bend in the rear driving shaft. The journal box of the street car had been smashed and the car was unable to proceed on its way without repairs. Today these steel wheels run as true, and excepting for the outside finish are in as good shape as the day they were put under the machine. There is no other movable part of my machine that gives me so little trouble as the wheels. Yours respectfully, F. H. LINDENBERG.

Mr. Hastings, of Hastings & Miller, the large photographic supply house of New York, writes as follows:

New York, October 15, 1902.

The Midgley Manufacturing Company, Columbus, Ohio:

Gentlemen—I wish to repeat the statement made by me to the Automobile Magazine, of New York, which appeared in the October issue of that journal.

The Midgley old style tubular steel wheels which I purchased from you and used on my locomobile for a year or more, which replaced the wire ones on my machine, are as good today as when first put on, although I have used the little steamer upward of 4,000 miles. One day I punctured a tire on Long Island and drove eighty miles on the Midgley rim, a good part of the way over cobble and brick pavement. I am satisfied that no other wheel would have stood that treatment, but there was scarcely a mark on the rim. I am now using your new artillery pattern on the new touring steam vehicle built by myself during odd times.

Wishing you the unbounded success that such an article as the Midgley tubular steel wheel merits—which I consider the best wheel in the market today—I remain, Yours very truly, T. K. HASTINGS.

You had better get the best wheels when ordering your 1903 Automobile. Say "We Want Midgley," and you will get them.

The Midgley Mfg. Co.

Columbus, Ohio.

Eastern Selling Agent:
THOS. J. WETZEL, 50 Warren St., New York
Western Selling Agent:
K. FRANKLIN PETERSON,
165 Lake Street, Chicago

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Motor Age

WITH WHICH IS INCORPORATED CYCLE AGE

VOL. II. NO. 22. CHICAGO, NOVEMBER 27, 1902. $2.00 PER YEAR

THE MORGAN HEAVY FREIGHT TRUCK

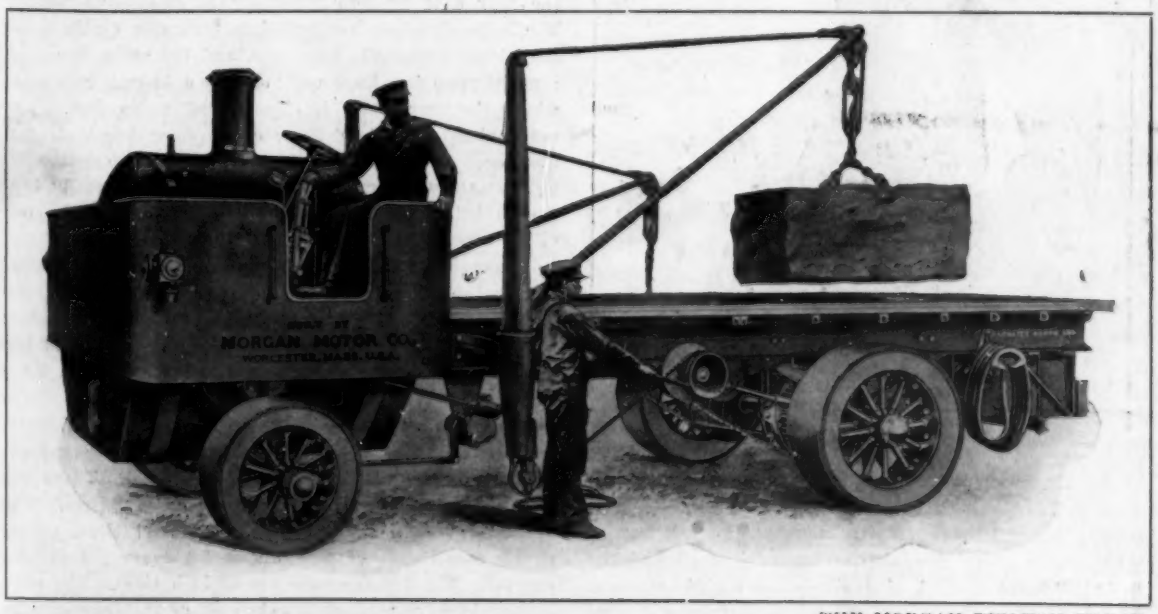
NOT MORE than six months have elapsed since Mr. Morgan severed his active connection with the International Motor Car Co.—by which, however, he is still retained as consulting engineer—and proceeded to Worcester to take up the work of the Morgan Motor Co. He had previously produced samples of the principal parts which were to make up the complete vehicle, and the interval has therefore been spent in the actual manufacture of motor trucks for general freight hauling. One of these, ready for delivery, and actually engaged in the work for which it was built, forms one of the subjects of illustration.

The general dimensions of the Morgan ten-ton truck are as follows: Total length, 22 feet 5 inches; total width, 7 feet; loading space, 16 feet 10 inches; total loading area, 116 square feet.

One of the Wheels.

What may be called the foundation of the truck is formed by two 9-inch I beams. These are tied together with 3-inch beams for that part of the frame which carries the loading platform; by two 3-inch channels in front of and 7-inch I beams behind the boiler, and also by the boiler suspension, and by two 6-inch deck beams over the rear axle.

The boiler is of the water-tube type, the design being something like that used on torpedo boats. The steam drum and the two mud drums are of extra heavy steel tube, and have at

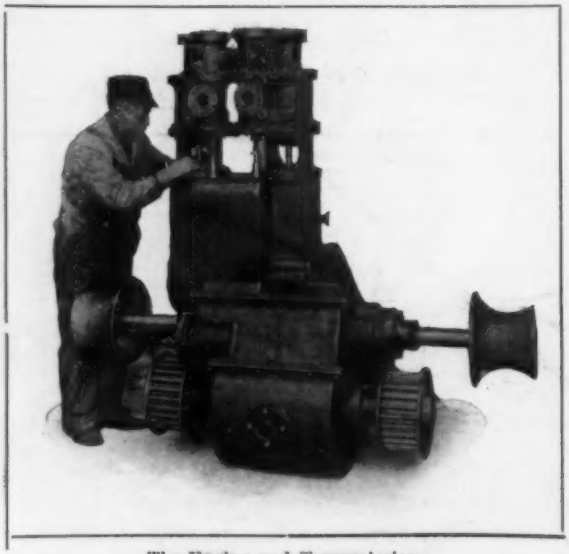


THE MORGAN TEN-TON TRUCK.

each end large hand holes, so that the entire boiler may be easily cleaned. These drums are connected by 1-inch seamless steel tubing, the joints being of a special design, which makes the replacement of tubes an easy matter. In case a tube gives out and there are none on hand for repairs, each opening may be effectually closed by the insertion of a flanged plug. There is a dome above the steam drum which thoroughly dries the steam before it is taken to the engine. The whole is encased in a double steel jacket, with a 1-inch lining of fire felt next to the flame, and by a 1-inch porous asbestos lining between the shells. By breaking the steam and water connections and removing four bolts the entire boiler may be lifted bodily from the truck. The boilers are given a cold-water test of 600 pounds, and also a steam test of 300 pounds. The safety valve, which is of the locomotive, muffled pop type, is set at 225 pounds. The working pressure is 180 pounds. Water is supplied to the boiler by a power pump geared to the engine, the amount being regulated by the usual by pass.

Either fuel oil or kerosene may be used for generating the steam. The burners, of which there are two, are easy of access, and may be drawn out together by the disconnection of a single joint, which may be reached either from the front or from the rear. The oil is not carried under pressure in the tanks, but is forced into the burners by a small pump that is geared to the engine.

The engine is a double tandem compound, with the cranks set at 90 degrees. This type is considered superior by the Morgan company to the cross compound engine, ordinarily used on such vehicles, particularly in that it is at all times possible to start the truck from a stand and without reversing. The crank shaft and the main gear are formed of a single solid piece of steel. The working parts are inclosed in an oil-tight case from which the cylinders are separated by an intermediate frame. This renders it easy to change the piston and valve rod packings and also prevents the steam from passing from the cylinders to the crank case and there condensing. By a special throttle it is possible to admit live steam to the low pressure cylinders, thus very near doubling the power of the engine. From the engine the steam passes to a combined feed water heater and separator. The water of condensation is returned to the water tank, and whatever steam may be left passes into an exhaust head of special design in the space over the boiler and is evaporated.



The Engine and Transmission.

The oiling of the various parts of the engine and transmission is cared for by a small power pump, oil being drawn from the lowest point of the tank and carried through small copper tubes to the various bearings. This system of forced lubrication drives a stream of oil constantly about each bearing, tending to prevent hot boxes and reducing the wear to a minimum. The transmission gear is also entirely enclosed and runs in a bath of oil.

Nothing but spur gears are used throughout the truck. Two ratios of gearing are provided. With one the engine makes ten revolutions to one of the driving wheels, and with the other twenty. The sliding gears are on an intermediate shaft between the engine and main sprocket shaft, the compensating gear being on the latter. The engine and transmission gears are in a single case, which is suspended at three points. The cylinder end of the engine is connected to the frame by a pivot joint, and the other two points of suspension are in the ball and socket bearings of the intermediate shaft, which are secured to the two main I beams. This method of suspension prevents strains from being communicated to the engine or transmission gear.

The power is carried from the intermediate shaft to the rear axle by two 5-inch by 1½-inch pitch chains. The large sprockets are bolted to drums or quills. One quill is cast onto the rear axle, and the other is a running fit upon it. Each quill carries a 5½-inch hub, over which the rear wheel is slipped and made fast. The outer rims of each of these quills form break drums, upon each of which act two shoes. These are controlled by a small steam cylinder. The brake is powerful and double acting. Throughout the transmission the use of keys has been avoided wherever possible.

The entire rear axle construction is especially heavy. It is not divided, the quill construction leaving the rear wheels free to act separately. The axle itself revolves in two 5½ by 11-inch bearings that in turn support the rear spirngs. These, and, indeed, all the outside bearings on the truck, are protected from dirt.

Special care has been given to the design of a wheel which will withstand rough usage. The hubs are extremely large and the spokes are of steel. There are two metal tires between which are wood felloes. The rear wheels are fitted with 12-inch steel tires, giving nearly two inches of tire surface for every ton of load carried. The front wheels are 7½-inch tires. The pulling strain of the engine is taken off of the rear springs

by struts braced against the two 9-inch I beams. The front axle, which is under the center of the boiler, is of 4-inch stock and supports the main frame on pedestals. Helical springs are here used. The steering pivot axles are of nickel steel.

The oil tank, which holds 80 gallons, is underneath the body of the truck, just back of the boiler. It is made of 3-16-inch sheet steel. Under ordinary circumstances the tank will hold enough to carry the truck from 30 to 40 miles. There is a hand hole at the top and an outlet at the bottom so that the tank can be easily cleaned.

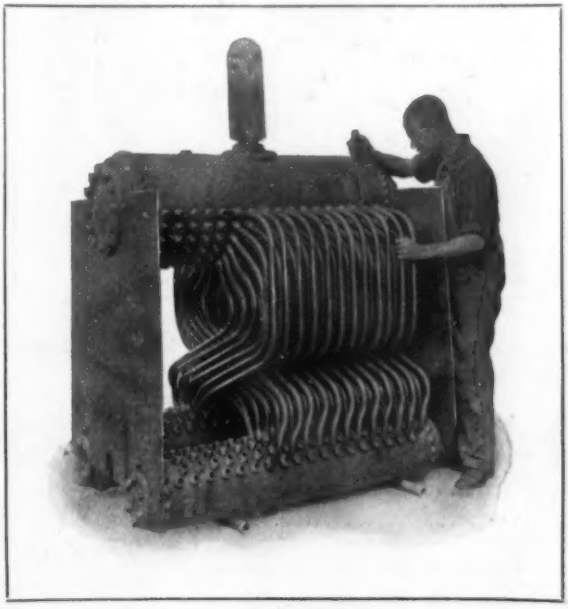
The steel water tank is hung at the rear of the truck. It has a capacity of 250 gallons. There are drains on the bottom and a manhole at the top, which is large enough to render it easy not only to wash out the tank, but to scrub it with a broom if necessary, or to get inside for painting. The water tank is ordinarily filled by a steam siphon to which is connected a 1½-inch hose. This is always carried with the machine on a convenient bracket. On the front of the water tank is mounted a small duplex steam pump, which may be used to fill the boiler when the engine is standing still.

The driver's seat is on the left hand side of the boiler, and there is a seat on the opposite side for a helper. In front of the driver are the water-guage glass, which is of the reflex type, and the valves which control the machine. The throttle is of new design. It is so made that when the lever is pulled back from the center steam is admitted to the engine, but when the lever is thrown ahead of the center, the full boiler pressure is admitted to the brake cylinder previously mentioned, and the machine is brought almost immediately to a full stop. If for any reason the brakes should fail to work, the engine is amply strong to withstand the strength of reversing under steam. The valves for admitting steam to the low pressure cylinders and to the steam pump are close to the main throttle lever. Steam may be shut off from all parts of the machine by a main gate valve placed close to the boiler.

The Morgan company affirms that it is possible to back the machine into an excavation and bring it out under its own power. The assurance of the possibility of such a feat is, however, not based upon the ability of the truck to pull itself out by tractive power. On each end of the intermediate shaft there is a capstan. It is possible to throw the engine out of gear with the main transmission so that it acts only upon the shaft bearing these capstans. Hawser eyes are provided at the front and rear of the machine. By tying one end of the rope to a tree or telegraph pole, and bringing it back through the eye to the windlass it is possible to lift the truck out of any kind of a hole, so long as the tree remains in commission. These windlasses may also be used in connection with jib cranes, of which there is one of two tons capacity on each side of the machine. By the aid of these cranes it is possible to load the machine in a few minutes.

There are two items which effect pre-eminently the cost of trucking—one is the time required in the actual moving, and the other is the time spent in loading and unloading. There is no doubt whatever but that runs may be made much more quickly with a motor vehicle than with horse-drawn wagon, but the matter of loading and unloading is something to which little attention has been given.

With the horse-drawn vehicle the methods of mechanical loading are few, and in most cases the loading mechanism is entirely distinct from the vehicle, or is in

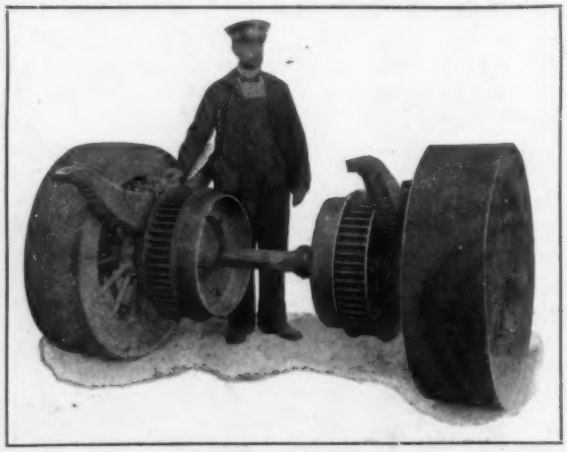


The Water Tube Boiler.

the form of a hand winch at the front end of the truck. When, however, the work of transportation is to be done by a power machine the problem becomes simpler. The two cranes and the capstans of the Morgan truck will, of course, aid greatly in taking on heavy loads of almost any description, especially where the stopping places are many. It is possible, however, when regular runs are being made with two or three set stopping places, to reduce to a low minimum the time that the wheels must stand still. To accomplish this a system of interchangeable bodies has been designed, the general method of operation with which would be as follows: Say, for instance, that one of the trucks is to be run between two stations. Two or three bodies, strongly and cheaply built, would be supplied with each truck. At each station slips would be let into the platforms. When the truck backs into one of these slips the body is left upon the platform in such a way that it is possible for the truck to run out from under. While this body is being loaded the truck can back into a second slip and there pick up a loaded body. This dropping and picking up of the bodies would occupy ordinarily about two minutes, as against anywhere from thirty minutes to an hour or more with the other system. These bodies are of a nominal cost in comparison to the original cost of the truck, and by employing them it is possible

to at least double the efficiency of the truck, thus cutting in two the cost per ton-mile of carrying freight.

To show the great saving in cost of handling freight with automobiles the following tables, based on horse-



The Drivers and Axle.

drawn truck usage and on the service which the Morgan truck will render, have been compiled:

COST OF HAULAGE BY HORSES.

Four horses at $200	$ 800.00	
Truck	500.00	
Harnesses at $50 per horse	200	
Blankets at $1.50, two sets	12.00	
Stable extras, brushes, harness dressing, etc.	25.00	
Cost		$1,537.00
Depreciation 10 per cent per annum of vehicle	$ 50.00	
Depreciation 25 per cent per annum of horses	200.00	
Depreciation 25 per cent per annum of harnesses	50.00	
Depreciation 100 per cent per annum of blankets	12.00	
Depreciation 100 per cent per annum of brushes, etc.	25.00	
Total depreciation		$ 337.00
Wages		1,300.00
Feed, 365 days		730.00
Shoeing	$ 350.00	
Veterinary services	100.00	
Maintenance of vehicles	75.00	
Maintenance of harnesses	20.00	
Total maintenance		$ 545.00
Interest on investment at 5 per cent		61.85
Insurance at 1½ per cent		21.55
Cost to operate		$2,995.40

COST OF HAULAGE BY MOTOR TRUCKS.

Cost	$7,500.00
Depreciation at 15 per cent per annum	1,125.00
Interest at 5 per cent	375.00
Insurance at 1½ per cent	112.00
Wages	1,300.00
Fuel, 275 days	770.00
Lubricating oil at 50 cents per day	187.00
Spirits and waste	50.00
Maintenance and repairs	300.00
Cost to operate	$4,219.00

Assuming that a four-horse team travels a total of 15 miles per day, and that a load is supplied only one-half the time; or, in other words, that there are 7½ carrying miles, with a load of 7 tons, the ton mileage is 52½. This multiplied by the available days in the year, which may be taken as 275, gives a yearly ton mileage of 14,437. The yearly cost to operate divided by this figure gives a cost per ton-mile of $.208.

Assuming in the second case that the car runs 40 miles per day, of which as above only one-half the distance is covered with a load, the total ton mileage will be 200. This multiplied by the 275 days gives a yearly ton mileage of 55,000. Dividing the yearly cost to operate by the yearly ton mileage, the cost per ton-mile of $.0767 is obtained.

Special Train for Show Exhibits.

Secretary Harry Unwin, of the N. A. A. M., has a great idea and with his accustomed activity has started at once to investigate its possibilities. He rightly thinks it would be a good scheme to have a special train to carry the exhibits from the New York to the Chicago show.

"I think," said he to a MOTOR AGE man, "that at least 25 of the New York exhibitors would be glad of such a chance and that with each transporting on an average of four vehicles, the train carrying them would be a very impressive affair. The makers could placard the train with effective signs referring to the contents of the cars and embracing valuable advertising matter. Press notices sent ahead would insure a sensation and public attention at each town through which the train would pass. All this would be of great advertising benefit to the association, the makers and the Chicago show."

The executive committee of the N. A. A. M. has just sent out a circular letter to tire and rim makers suggesting that they mark their product with distinctive labels. There is a surprising amount of ignorance among automobilists as to the brand of inner tubes and rims they use. The valve stems of the inner tubes are not standardized and the rims of various makers differ. When replacement is necessary much doubt and confusion ensues as to what factory to send to or what brand to apply for from the dealers.

Members are to be asked to send in statistics of the roads in their localities that the association may have at hand valuable information when it is asked to cooperate in various highway contests that may be promoted. If the makers would supplement these statistics by calling on their agents for particulars of the roads in their localities a very complete highway information encyclopædia could be compiled.

Arrangements have been concluded with the Waldorf-Astoria management for the holding of the annual banquet of the association at that famous hostelry. It will occur on Friday evening of show week and will be held in the Astor Gallery.

The positively last available corner in the Madison Square Garden basement was put on the diagram and sold this week.

Oiled Road Result.

Oiled road experiments are being made in New York. A mile stretch on Fort Hamilton avenue, Brooklyn, between the bay and the ocean parkway was treated with crude oil a month ago. It is still as smooth and free from dust as the day it was laid.

Automobile for Trolley Wire Repairing

In Paris one of the principal street railway companies, the East Paris Tramway Co., has replaced the horse with the automobile in its trolley wire repair service. There, as in American cities, scaffold wagons on whose airy perches workmen accomplish repairs upon the overhead wire system, have been common sights, but such scenes have until recently included the plebeian horse. The East Paris Tramway Co., believing that the automobile would be cheaper and more efficient for this work, ordered a special car from the Delahaye automobile factory, and it is now in constant operation. The accompanying illustration shows this machine with its folding scaffold extended for repair work on the wire system overhead.

The wagon is substantially a regular Delahaye 12-horsepower car with a special body. The chassis is the same as that of the regular carriage, slightly changed and strengthened in some parts to suit the new and rather heavy purpose. The motor is of the two-cylinder horizontal pattern, located under the front end of the body. The platform on top of the folding scaffold can be shifted from one side to the other so that work can be done on either side of the overhead wire without moving or turning the wagon. The platform is also pivotally mounted so that it can be placed at any desired angle to the car. The car makes its regular inspection trip at a speed of 6¼ miles an hour, but can on occasion, such as a hurry-up call, run 13 miles an hour carrying six men and a full load of 3,000 pounds of material and repair tools.

This wagon has readily demonstrated its ability to increase the efficiency of the service for which it is intended. It can run to the scene of a break or other trolley disaster much more rapidly than can the horse drawn scaffold wagon, and can also maneuver into working position much quicker and in less space. On its regular inspection service it can make about twice as many trips a day as a horse drawn wagon, thus serving the purpose of two of the old rigs.

The original cost of the automobile was approximately $2,500 and the depreciation, interest and repairs have been estimated at $525 per year. The cost of two horse drawn wagons and six horses would be $2,350. The depreciation, interest, repairs, the feed and care of the horses and the wages of two drivers would be $3,150 per year. For this amount, minus the depreciation, interest and repair item for the automobile, the latter can be run 90 miles a day, which is just about double the service which the two horse drawn outfits would render. In other words the automobile outfit can render the same service as the horse drawn wagon for half the operating and maintaining expense, or can render double the service for the same expenditure.

The successful experiments which have been carried on with this wagon are not more gratifying to the street traction company than they are to the automobile industry. Automobiles have no greater or wider field for usefulness than in the ordinary business of both large and small communities. Here it is not style nor inclination that is gratified in introducing them, but the actual desire to secure better service for less money. Consequently when an automobile is installed in business because it has demonstrated such a saving, its use is permanent.

Every automobile built for commercial purposes is a coffin nail for the horse of the business world, and whenever an automobile such as this street trolley repair wagon demonstrates its ability to cope with conditions much more exacting than those of pleasure automobiles, the manufacturers of automobiles are led a step further in their efforts to build business as well as pleasure vehicles, and the thousands of probable users of the former class of machines are led a step nearer the conclusion that sooner or later they must for self protection adopt the automobile. It furnishes stimulant for the maker and demonstration for the future user.

The Scaffold Automobile in Use.

Motor Age

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The editor will be glad to receive communications for publication. They must be accompanied by the names and addresses of senders, which will not be used if request be made to that effect. Contributions will not be paid for unless accompanied by notice that payment is expected.

Subscription, Two Dollars a Year, - Six Months, One Dollar

THE NEW YORK-CHICAGO RACE

CLUBMEN, manufacturers and others directly interested in automobile competitions now have before them prominently the question of a road race from New York to Chicago. The 100 mile endurance runs of the last two seasons have settled the fact that an automobile can make such a trip without much trouble, while the recent reliability run from New York to Boston and return has settled the fact that a week's trip can be easily negotiated by a large percentage of American machines of all styles.

One hundred mile runs are no longer great affairs and may not even be warranted as future demonstrations of the ability of automobiles. Even 500 mile reliability runs have lost their savor, for at the necessary expense they come high when merely demonstrating what was indeed very well demonstrated by the Boston trip. If further demonstration of the automobile's general utility is needed by the public, and if new, fresh interest is desired in the sport of automobiling, a more spectacular, less restricted and much more difficult run is necessary. This means the New York-Chicago trip or some equally long and difficult journey.

Inasmuch as those of the automobile clubmen of the country who favor such an event speak of it generally as a New York-Chicago race instead of in general terms, and inasmuch as this route not only connects two of the most prominent automobiling centers of the country and passes through almost a dozen other thriving centers, but in addition furnishes a variety of road which is desirable in giving a representattive demonstration of automobile service over typical American highways, it is hardly plausible that any other route would be selected in case such an event should be promoted.

Thus the question of future tests becomes almost certainly the question, "Shall we have a New York-Chicago race?"

Probably we shall. Many prominent members of the Automobile Club of America favor such an event, and it is certain that the Chicago Automobile Club, which has all along had the project in view, will heartily cooperate. Even those members of the eastern clubs who are opposed to actual, unrestricted racing on the highways, believe that the speed limits which have previously governed road contests can be raised by making the daily pilgrimages longer. The radicals, of course, desire a bona fide race—first in, winner.

In view of the custom which endurance test drivers have of rushing over good stretches of roads that they may run slowly over bad ones and still be on hand to loaf into the next control, it is probable that a raised speed limit would not cause more dangerous scorching. The complete lifting of the speed limit would, of course, result in attempts to get all possible speed out of the machines, but if the course were properly patrolled, especially through towns, it is likely that less injury would be done when scorching over good roads than when trying to cover poor ground rapidly. In other words, accidents to the machines might be in greater evidence than accidents to the public.

The question is certainly an interesting one, and a real contest over a thousand mile course, if governed by regulations just restrictive enough to prevent newspaper and public censure from falling upon competitors and just liberal enough to make the competition keen and interesting, would go a long way toward demonstrating the fact that American automobiles are all right, while American roads are mainly otherwise. Demonstration of the necessity of better roads is just as much a part of the promotion of automobiling as the demonstration of the fitness of the automobile.

AUTOMOBILE SUBURBAN SERVICE

BECAUSE it could not afford a street car system, a small German city has set about to establish an automobile 'bus line for the purpose of connecting the suburban residence districts with the business center. The lesson is obvious. If a city which cannot afford street cars adopts the automobile to secure street transit service, there ought to be a considerable saving in many other localities if the present street car routes were replaced by automobile routes. The automobile street car service comprises rolling stock mainly. The rolling stock of a street railway system is only one of several large items of equipment and maintenance. Why should not the automobile service be cheaper, especially in districts where traffic is not overly congested and where

quick running between more or less distant points is an important consideration?

Real estate dealers in North Dakota use private automobiles for showing prospective buyers the farm lands which are for sale. In several communities the automobile has been successfully tried in rural mail delivery. Suburban transit service, country service, and rural mail service are fields in which the automobile is eminently adaptable. Probably the one thing that most hinders its more rapid adoption in these usages is the fact that American manufacturers have not given the attention to special vehicles for these fields that the wideness of future use warrants.

City councils, local business men, post office authorities, etc., are always open to the conviction that the automobile is superior to the horse drawn rigs commonly employed, and are not slow to adopt the new conveyance when it means better service for less money. But they cannot be expected to grab the automobile trade by the coat-tails and beg to be convinced. The producer must make the vehicles and offer them for sale before the purchases will be made. So it is probable that there will be a wonderful increase in the use of automobiles for these purposes when the manufacturers have gained on orders for pleasure vehicles and prepare for active work in the production of passenger service vehicles. Companies now making only pleasure vehicles will increase their lines to include these newly important styles; the number of companies now making all styles of automobiles will increase and new companies will be organized for the especial purpose of building street and suburban transit automobiles. Then will their adoption become a quick process. The public is merely waiting upon the trade.

CORRESPONDENCE FROM READERS

RELIABILITY tests of various sorts have been held with the dual purpose of demonstrating that automobiles of the present day are reliable road vehicles and of obtaining facts concerning the cause of trouble and chances for improvement. Much valuable data has been secured but at considerable expense, and in the prominence of the news or showy features of the events much of the practical information concerning the service rendered by the various vehicles has been lost.

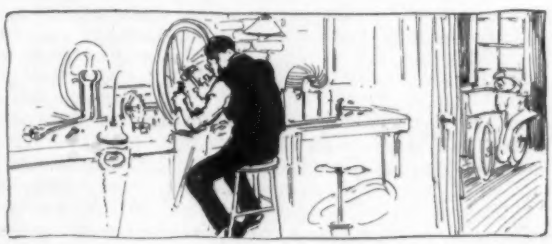
Reliability tests and endurance runs are going on constantly throughout the country. Every vehicle owner, especially he whose ride takes him into the open country, is a participant in these events. The information gained by each one is valuable, and is of just as much interest to other automobilists and to the trade as that gathered in set events of prominent news value. Hence MOTOR AGE believes that one of its most valuable departments is that of correspondence. But in this of all its departments it needs most the co-operation of its readers. Every reader of the paper is not only welcome to share with others the free use of the correspondence columns, but is earnestly requested to do so. It matters not how seemingly trivial the incident or how elementary the question. Any story of automobile service or any query on a troublesome point furnishes fresh knowledge to many other readers and leads to new thought and improvement.

MOTOR CAR REPAIR SHOP EQUIPMENT

PROBABLY there is no more difficult line of repair work common today than that of automobile repairing. Yet even in vicinities which boast many automobiles and several storage stations and repair shops thoroughly equipped work rooms are scarce. Automobile repairing requires not only individual skill. It requires tools, and these tools must be first class.

It has been found expedient by the several large repairers who have made the question a study, to remake many injured, broken, or unsatisfactory parts, which in shops not provided with sufficient tools are in some manner patched up for the purpose of securing immediate working results even at the risk of future trouble and expense. It has also been found that repairers can do a lot of successful experimenting and many improvements in minor details of automobiles have originated in the repair shops.

Owners very frequently desire small changes as well as repairs, and all of the repairer's ingenuity and knowledge of the subject is unavailing unless backed by suitable and sufficient working tools. Furthermore, it often occurs that new parts for replacing damaged ones cannot be secured quickly from the maker. In such cases the making of the part in the repair shop becomes both trade winning and profitable.



CHICAGO CLUB'S CLOSING RUN

Trip to Milwaukee and Return over Wretched Roads and Partially in the Darkness.

The new directors of the Chicago Automobile Club scored a distinct triumph on Saturday and Sunday last. They held their first meeting on Tuesday of last week and decided that in view of the splendid weather a run to Milwaukee would furnish a fitting wind-up to the season's sport. Every man present promised to participate, and every one kept his promise. The word was passed quickly and as a result a dozen machines left Chicago shortly after 10 o'clock Saturday morning. Among those in the party were Honore Palmer and Mr. and Mrs. Keith, in a Robinson touring car; Mr. and Mrs. Frank X. Mudd and P. H. Sercombe, Winton; Mr. and Mrs. C. W. Gray, Winton; W. H. Hoops and two sons, Packard; Dr. F. C. Green and party, Autocar; Mr. and Mrs. J. B. Burdette, Oldsmobile; Mr. and Mrs. J. E. Stevens, Oldsmobile; G. S. Chapin and Mr. Robinson, Friedman; S. A. Miles and R. H. Croninger, Friedman; Robert B. Fort and party, Packard; Mr. and Mrs. Lloyd and Miss Lloyd, Peerless; Mr. and Mrs. Paul Picard, Renault.

The first stop was made at President Palmer's mansion on the Lake Shore drive, where the party was photographed. Before leaving the park a broken

At President Palmer's Residence.

sprocket necessitated the retirement of Mr. Hoops. At Evanston one of the Friedmans dropped out. Arrangements had been made to round up at Waukegan for lunch, and at this point the remainder of the party was intact, though widely scattered. Here the real struggle began. The roads as far as Highland Park had been splendid. Beyond that point—well, there are no roads. Years ago some wandering farmer figured that by sticking to the lake shore he would eventually reach Milwaukee, and he stuck. The next traveler and the next followed his tracks, and between them they established a "road." Occasionally as one nears a town some attempt at improvement may be found, but for the rest —nothing but interminable sand and clay, almost impassable at the dry season and simply a slough of despond at other times. But despite a bitterly cold northwest wind, blowing directly in the faces of the operators, the Chicago club men and their ladies struggled on. At 5 o'clock darkness fell. It would be difficult to imagine a more dreary prospect. But nobody weakened. At Racine, 70 miles from the start, Dr. Green was obliged by a burst tire to leave his Autocar and proceed with one of the other members of the party. All hands reached the Pfister, at Milwaukee, about 10 o'clock at night, tired, dusty, chilled, but still in the game.

The return journey commenced at 10:30 Sunday morning, the worst part of the road being taken in daylight. Mr. Fort, with his Packard and Dr. Green, remained in Milwaukee until Monday. The party stopped at Racine for lunch and spent nearly two hours there. Mr. Lloyd was obliged to retire owing to the stripping of the gears in his differential. The party eventually reached Highland Park and civilized roads before or shortly after dark. Those who went to the club house arrived between 7:30 and 8:30 in the evening, no serious mishap or breakdown having occurred.

Boston-New York Record Shattered.

New York, Nov. 21.—Kenneth A. Skinner and Albert Champion arrived here this afternoon from Boston in an 8-horsepower tonneau bodied De Dion-Bouton, having made the journey in 13 hours 22 minutes elapsed

In Front of Pfister House, Milwaukee.

time, and broken the record. After dinner they started for the return journey with the idea of establishing a round trip record under thirty hours.

The former record, 13 hours 30 minutes, was made by Harry A. Fosdick in a Winton on October 15, the last day of the reliability run. Fosdick lost nearly an hour through running into a pile of stones en route. Both record breakers covered a course from the Thorndike Hotel, Boston, to Central Bridge, New York, a distance of about 250 miles.

Boston, Nov. 23.—With a new automobile record from New York to Boston of 14 hours 22 minutes, Kenneth A. Skinner and Albert Champion rolled into Copley Square yesterday afternoon. Leaving New York at midnight Friday they had succeeded in covering the 250 or more miles in record time. They also established a record for the round trip, Boston to New York and return, of 35 hours, as this trip has not been made continuously before.
N. A. A. M.

Keene Will Not Pay Fine.

Foxhall P. Keene, who lost his excessive speeding case this week at Oyster Bay, L. I., and was fined $20, will appeal. Justice Franklin took the evidence of the auto-catcher's watch against the testimony of C. R. Mabley and the French mechanics that under the uphill conditions that existed a 6-horsepower Renault with three passengers could not attain a speed of 20 miles an hour.

AUTOMOBILISTS AID GOOD ROADS WORK

A. C. A. Committee Reports Rapid Strides in New York State—Urges Club to Increased Effort.

In last week's report of the annual meeting of the Automobile Club of America, MOTOR AGE mentionel briefly the report made by President Shattuck for the good roads committee. This report contained much of interest concerning the progress of the good roads movement in New York state and the part taken in the work by automobilists. The report follows:

As a member of your good roads committee, I attended the third annual good roads convention held at Albany on January 26 and 29, 1902. This convention is made up from delegates from the boards of supervisors throughout the state. I was particularly struck with the earnest endeavor on the part of this convention to improve the condition of our roads in New York. The convention directed its law committee to prepare two important bills.

First—That the present system prevailing in many towns where the roads are worked by a day labor tax assessed upon farmers be done away with and that the road tax be collected in money.

Second—That the state bond itself for twenty millions of dollars, the proceeds to be used under the present Higbie-Armstrong law in building state roads.

Bills as above were introduced in the legislature, but were not passed because of the early adjournment of that body. They, however, had an excellent effect upon other legislation then pending. At the last session of the legislature the Plank bill was passed, which provides that any town abandoning its labor system and collecting the road tax in money shall have added to the amount so collected a premium of 50 per cent in money by the state. The Armstrong bill provides that if the counties fail to take care of the state roads, allowing them to fall into disrepair, the work may be done by the state engineer and charged to the county.

This convention also had a most excellent effect upon the annual appropriation under the Higbie-Armstrong bill, and the state's share was increased to $795,000, which, with an equal amount to be added by the towns and counties, made the last year's appropriation for state roads $1,590,000, sufficient to build about 200 miles of stone highway. The work of this convention was so important that the United States government published the proceedings in full, and a copy of them has been sent to each member of this club.

The state engineer, Mr. Bond, under date of November 12, 1902, writes:

"The amount of state road completed to date is about 156 miles. There are a number of roads which are so near completion that we hope to have them ready before frost, but our work has been greatly hindered by the continuous rains throughout the season The amount of road in process of construction is about 200 miles. The amount of road surveyed in excess of the above 356 miles is about 750 miles.

"At the present writing plans have been approved for 82 roads covering about 310 miles, at a total estimated cost of about $2,600,000, of which the counties have contributed their half. The total mileage for which petitions have been received is approximately 1,900 miles; new petitions are coming in fast.

"Out of the total moneys which have been appropriated by the state 356 miles have been completed and are in process of construction. No further roads can be taken up for consideration until the legislature makes another appropriation. The counties have already appropriated $1,300,000, and before the legislature adjourns it seems quite probable that this amount will reach $2,000,000."

It is the opinion of your committee that there is no better work for the club than the encouragement of the building of state roads. We have now in Westchester county under construction two lines of road, one of which extends from White Plains to the northern boundary of the county, and the other of which extends along Sawmill river from Woodland to the northern boundary of the county, which it is expected will be completed next spring. They cover something over 60 miles. Another road has been surveyed, running east and west, along the northern boundary of the county, but this has not yet been accepted by the board of supervisors and will not be completed for a year or two. Two roads connecting with the two first named have been surveyed running north and south, right through the eastern portion of Putnam county. They have not yet been accepted by the board of supervisors of that county, and cannot be completed for a couple of years. Your committee is endeavoring to have these roads built and also to have this line of good roads extended through Dutchess county along the line of the Harlem railroad.

There will be another good roads convention at Albany in January at which we should be represented and at which the bonding scheme will be strongly urged. An annual appropriation of three quarters of a million or a million on the part of the state is very well, but it brings us our good roads too slowly.

A road has been built around Nelson hill in Putnam county. This hill was almost impassable to any but a high-power automobile. This road was built by subscription by William Church Osborn, and the club contributed the sum of $250. It is now possible for a moderate power automobile to make the trip up the Hudson river on the east bank.

The condition of the roads leading into this city is most unsatisfactory and disgraceful. We have done everything that we could during the past year to improve them, but there seems to be a want of money, a want of judicious expenditure of what money is spent and a want of knowledge of how to do the work in the best and most economical way.

Your committee early last February, in connection with the Associated Cycling Clubs and the Road Drivers' Association, had a hearing before Mr. Cantor, president of the borough of Manhattan, and Mr. Haffen, president of the borough of the Bronx. They pointed out to them the necessity of improving certain highways in this borough and in the Bronx so that there could be two through roads, one on the east side and one on the west side between this city and the country lying north of it. We are sorry to report that comparatively little has been done in improving the roads named.

In the Bronx, Sedgwick avenue has been re-surfaced and a little work has been done on Jerome avenue, but the cross-walks on Jerome avenue have not been removed, and no matter how the macadam on that avenue is built up, so as to be level with the cross-walks, it soon wears down, and we have to pump over these cross-walks in a way which is not only disagreeable but dangerous because of the liability of breaking the vehicle.

The good roads movement is spreading and broadening rapidly in Massachusetts, in New Jersey and in this state, and I venture to predict that it will only be a few years when the statesmen and politicians throughout this country of ours will be forced by the demands of their constituents to build and maintain good roads throughout the entire country; but the people themselves have much to learn in knowing how to care for, keep in repair and use improved highways.

Sues for Race Prizes.

Thomas Holden, Jr., who won five prizes, to the amount of $250, at the Brighton Beach meet in August, has sued the Long Island Automobile Club, the promoter, for this sum. Holden also threatens to bring charges against the L. I. A. C. before the A. A. A. and ask that it be compelled to pay or be refused future sanctions.

The meet was a financial failure largely owing to the very liberal cash or plate prizes offered. A. R. Pardington, chairman of the committee in charge, says that all the prizes will be paid and that Mr. Holden is the only winner who has refused to be indulgent and give the club time to pay.

Minneapolis Aldermen Given Free Rides.

The members of the Minneapolis Automobile Club one day last week invited the city aldermen to accompany them on a run through the business and residence districts. Fifteen aldermen were represented in the event and these were all ready to admit that the demonstration would be influential in preventing any radical legislation concerning automobiles. There are now several ordinances pending in the city council and the automobilists hope to secure liberal regulations.

Jersey Club to Have Rooms.

Jersey City, Nov. 23.—The Automobile Club of Hudson County members are to meet this week to decide on the location of club rooms. The corner of the Hudson County boulevard and Duncan avenue is the location most favored. Rooms above the Crescent garage there situated have been offered. The building is commodious and well adapted for the purpose.

Sign Posts on Motoring Roads.

The Automobile Club of America has nearly completed the erection of a series of enameled iron signs on the Hudson County boulevard, directing drivers to the adjacent cities and various ferries.

EUROPEAN NEWS

New Road Race Scoring System.

Paris, France, Nov. 12.—The scoring system to be used in the projected Paris-Madrid race was announced yesterday. It is a new scheme and may lead to interesting results in the scoring of the totals of the various contesting teams. For vehicles which make the entire run the time consumed will be the only record made, just as previously has been done in such long distance contests. For vehicles which cover only a part of the distance, to the total time officially taken at the last control passed will be added the time that would be consumed to finish the course at a rate of 10 kilometers per hour.

To illustrate this system of scoring, suppose there are two teams, each composed of five vehicles. Let all of the five members of the first team finish the course with the respective times of 21:20, 23:40, 26:50, 36:40 and 48:20. The team will be accredited with a total consumed time of 156 hours and 50 minutes. Let the second team be not so fortunate, only three of its machines finishing, these with the respective times of 15:16, 17:20 and 21:30. The fourth machine covers 200 kilometers in 31 hours and then stops. To finish the supposed course of 400 kilometers at 10 kilometers per hour a time of 20 hours is added to its unfinished score, making a total of 51 hours. The fifth machine stops at 300 kilometers, which are done in 30 hours, and the unfinished score is completed by adding 10 hours for 100 kilometers; making a total of 40 hours. The grand total for the team would accordingly be 145 hours and 6 minutes. The second team, by the fast running of the machines which finished and by the fact that two of its machines completed half or more of the course before dropping out and being scored at 10 kilometers per hour for the rest of the way, thus wins over the first team.

The rule has been established that all repairs en route must be made outside of the control enclosures within which the machines must remain over night, and that the time taken to make these repairs will be recorded as running time. Furthermore these repairs must be accomplished by the driver and with tools belonging to the car. It will not be permissible to change any essential part of the vehicle during the race and all such parts will be marked before the start to prevent surreptitious alterations.

M. Tampier, the official time keeper of the Automobile Club of France, is about to leave Paris for Madrid on a heavy machine to inspect the roads and select the most suitable route for the race. The road will be definitely announced as soon as possible in order to give the makers ample time to prepare their machines.

Vehicles in Common Usage Test.

The international *criterium* which the Automobile Club of France was to have held last October will be given this month. The affair has been promoted with view to comparing the service rendered by different vehicles in common usage. The classification of the cars in the table of results will be based upon the following items:

The operating expense in accomplishing ordinary service during a day in Paris over a distance of 41 miles on both specially selected and accidentally chosen streets.

Comfort and convenience in handling the vehicle.

The frequence of repairs and the time required for and the importance and cost of making the repairs.

The price of the vehicle.

The tests will be divided into two sections, one for city service and one for suburban service.

In the first section there are five classes, as follows:

Carriages for two or four passengers, without baggage and either closed or open.

Carriages for four passengers with 66 pounds of baggage per passenger.

Carriages for six passengers with 66 pounds of baggage per passenger.

Delivery vans able to carry a minimum load of 1,100 pounds and a maximum load of 1,650 pounds.

Motor cycles able to carry a load of 112 pounds in addition to the driver.

There are three classes in the suburban section, as follows:

Omnibuses for ten passengers with 66 pounds of baggage per passenger.

Delivery vans with a minimum load capacity of 1,650 pounds and a maximum capacity of 2,200 pounds.

Open wagons able to carry at a minimum load of 2,200 pounds.

As the Records Now Stand.

On the day in which M. Augieres successfully assaulted Fournier's recent mile record on the official record road near Dourdan, Thery with a Decauville carriage, also broke the mile and kilometer records for light vehicles, covering the mile in 48 2-5 seconds and the kilometer in 30 seconds. The records now stand as follows:

MILE—Heavy cars, 43 seconds, Augieres, Mors car; light cars, 48 2-5 seconds, Thery, Decauville car; motor cycles, 53 2-5 seconds, Rigal, Buchet machine.

KILOMETER—Heavy cars, 29 seconds, Augieres, Mors car; light cars, 30 seconds, Thery, Decauville car; motor cycles, 33 seconds, Osmont, de Dion machine, and Rigal, Buchet machine.

Paris "Antis" Organize.

In Paris, the center of all automobiling, there has been organized an anti-automobile league, with the avowed purpose of protecting the walking delegates of the city against the high speed of motorists. The league is embued with the idea that it can send automobilists to prison in addition to the payment of fines, and intends to give medals to policemen who do good work in its behalf. This is certainly an interesting bit of news and the league may furnish much merriment for the Paris police courts within the next few months.

Foreign Automobile Gossip.

The postoffice minister of Italy has decided that hereafter the distribution of mail in the various city suburbs will be done with light motor carriages.

Peronne, a town of 4,000 inhabitants in Italy, has thirteen automobiles, three motor bicycles and four motor tricycles.

Experiments have been made in Milan, Italy, by the postoffice authorities with an electric vehicle. It is built somewhat on the lines of a railroad postoffice coach, and has room for three persons; two to do the assorting and classifying of the mail while the third gets the mail from the boxes on the road.

Some German manufacturers, to avoid the heavy expenses always occasioned by exhibiting at shows, especially in foreign countries, propose being represented at the coming Paris show through a cinemetograph which would show their vehicles standing still, in action and taken apart.

CORRESPONDENCE

Best Type of Motor.

Boston, Mass., Editor MOTOR AGE.—I am about to build a gasoline motor for a four passenger carriage, and have three different styles of motors under consideration. Will you please inform me which you consider the best and smoothest running, and how they would be for power? They are as follows: 1. A 4 by 4-inch opposed cylinder motor, with cranks at 180 degrees, and both cylinders exploding at the same time. 2. A 4 by 4-inch double cylinder vertical motor, with pistons moving together and exploding alternately, so as to get one explosion for each revolution. 3. A 5 by 6-inch single cylinder horizontal motor. Do you think these motors are powerful enough for ordinary use at 15 miles an hour on good roads? Which type will run with the least vibration and be the most adaptable for my purpose?—O. W. C.

A two cylinder motor of any type will run with less vibration than a single cylinder motor. An opposed cylinder motor will have less vibration and develop power more uniformly with the cylinders exploding alternately than if they explode together. This was explained fully in the articles on the "Construction of a Gasoline Motor" published in MOTOR AGE about three years ago. A double cylinder vertical motor of the type mentioned will, if properly balanced mechanically, run almost as smoothly as the opposed cylinder type of motor. It has a further advantage in that the cylinder can be oiled by splash lubrication from the crank chamber. A single cylinder motor has less parts to get out of order, is cheaper to build, and more economical in fuel than a double cylinder motor. A 4 by 4-inch double cylinder motor should develop about 7½ horse power at 900 revolutions per minute, while a 5 by 6-inch single cylinder motor will give the same power at 750 revolutions.

Induction Coil Deterioration.

San Luis Obispo, Cal., Editor MOTOR AGE.—Will a jump spark coil get weak from use?—L. W. B.

Jump spark coils, unless especially well made and highly insulated, will in time become useless from several causes—being exposed to a moist or damp atmosphere, being placed too near the gasoline tank in the vehicle, making and breaking the primary circuit of the coil with the secondary winding on an open circuit—that is, with the spark plug detached from the motor, and the distance between the ends of the secondary wires too great to allow the passage of a spark—wrongly connecting the battery wires so that the secondary winding becomes short circuited with the primary.

The Question of Side Springs.

Kansas City, Mo., Editor MOTOR AGE.—I am about to build a small gasoline runabout and feel inclined to use the side spring construction for the running gear. Its obviously easy riding quality is an object to me as well as its simplicity and the ready manner in which it adapts itself to the motor and transmission system I intend to use. I have a notion, however, that such a gear might cause troublesome steering when the driver is alone in the vehicle or when one of the occupants of the carriage is very heavy and the other very light. If all of the weight, or the major portion of it, is on one side of the vehicle the spring on that side might be deflected so much more than that on the other side that the wheels on the heavy side would be so much farther apart than those on the light side that the accurate steering quality of the vehicle when properly balanced would be destroyed. How about this?—Edward Boyd.

While in theory such a condition might arise, it has been repeatedly demonstrated in practice that the tendency produced by the unequal balancing of the weight is not of sufficient importance to actually disturb the steering of the vehicle. The side spring construction as used in the Oldsmobile and in other similar carriages has been proven in every day use by such vehicles to be practical and amply safe in rough usage.

Curious Valve Accident.

Ferncliffe, N. Y., Editor MOTOR AGE.—A curious small incident occurred a few days ago and may possibly be of interest to your readers. I have under my care here among other machines, a 12-horsepower Panhard. This has been an exceptionally good machine even for this generally satisfactory make. I lately put in a new set of admission valves and later, when out for a run, two cylinders ceased to work. Upon investigation I found that the cotter pin had worked out of one of the valve stems and pumped over into the adjoining valve chamber where it had wedged the valve open, thus putting two cylinders out of commission.

The new automobile stage line between Rhinecliffe and Rhenebech is expected to be in operation by spring, as the three machines necessary to provide the proper service have been ordered—I think from the Daimler Mfg. Co. The statement made some time ago that 30 machines would be installed was a mistake as the traffic is not heavy enough to support such a number of vehicles.—B. Morgan.

Cylinder and Head in One Piece.

San Antonio, Tex., Editor MOTOR AGE.—I have a new air cooled motor in which the cylinder and head are cast in one piece. After running it for a short time the head becomes red hot and the cylinder so warm that the motor stops working. Can you tell me the cause of the trouble?—F. H.

The heat generated in the combustion chamber or head is transmitted directly to the cylinder walls in this type of motor, instead of having to pass through a copper or asbestos washer or packing ring as in the case of a cylinder with a separate head. It is not as good construction for an air cooled as for a water cooled motor.

Material for Bearings.

Milwaukee, Wis., Editor MOTOR AGE.—Would it be a good plan to use case hardened mild steel bushings for the crank shaft bearings of a motor bicycle, instead of the ordinary bronze bushings used?—S. M. B.

Steel would not be a desirable material to use for this purpose on account of its liability to "seize" or grip the shaft. The proper material to be used for this purpose is a high grade phosphor bronze.

Semi-Liquid Electrolyte.

New Orleans, La., Editor MOTOR AGE.—What is the composition of the jelly-like substance used in small storage batteries of French make?—J. C. R.

It is pure gelatine dissolved in one part of water, to which is afterwards added one part of sulphuric acid and five parts water, and mixed while still warm. It is used to prevent splashing and to also retard evaporation.

An Amateur's Experience in Auto Building

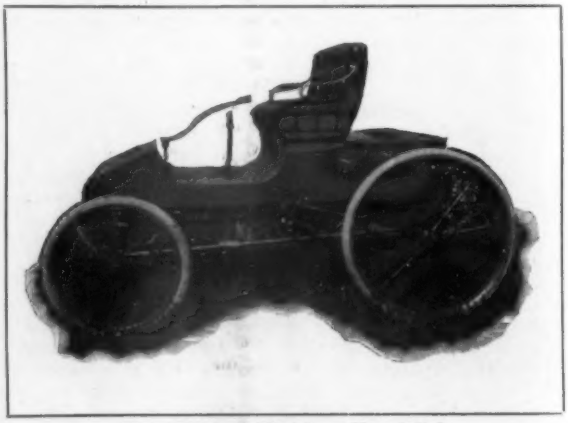
The next venture was to try the carriage on hill climbing and on a fine Sunday morning I was agreeably surprised to see it negotiate a long, steep hill with apparent ease. Then I wanted to see how it would behave going down hill, so I let it attain a good speed, when I found that it could be stopped in short space without disagreeable jerks. I again let the rig work up momentum and when near bottom of the hill I coupled in the engine to it. The engine ran, but without explosions, and was apparently dead. A half hour was spent in looking for the trouble which was not located until I removed the cylinder head covers and found that the sparking points were broken off. There I was four miles from home and with an interested friend whom I sincerely wished had not been invited to enjoy the trip with me. The old sparking device was of the make and break type, consisting of two arms, one of which rocked back and forth through a small arc, while the other was held by a helical spring in the center of this arch.

With the cylinder covers under my arm I started on the four-mile trot for home and after three hours of hard work in the shop had the arms replaced and was on the way back to the rig, which my friend was guarding. We rode home in good style and richer in experience. This sparking device would give a very good spark and the points would keep perfectly clean but sometimes the spring backed arm would be too slow in getting back to its central position with the result that the points would lock and something would have to break, the upper arm being actuated by a strong lever from the two-to-one gearing. I had several break downs on this account and for weeks I studied hard to construct an igniter that would be all right in every way. It might have been easy to do on a new engine where a proper place could be provided; I had only the cylinder head in which to put it. The old device was not adjustable and I wanted one which would permit the spark to occur at any desired point of the ignition stroke.

Finally I succeeded in making a make and break device of this kind. I have several times seen statements in trade papers to the effect that make and break sparkers cannot be made to successfully operate in small engines on account of the high speed. But I connected my device to a speed lathe running 1,500 revolutions per minute. There appeared to be a continuous stream of sparks, and in a night trial I was able to read a book by placing it closely under the decive. [The writer has *not* posted a forfeit to back this statement.—EDITOR.] Having it directly connected to the lathe running at the speed mentioned, would be the same as using it on a four cycle engine running at 3,000 revolutions per minute. Furthermore it will give a double spark, one right after the other. It is simple, noiseless and cannot easily get out of order. I intend to furnish full details of its construction when my patents are allowed.

With the old device I had only one way of controlling the engine—that of throttling the charge. With the new igniter I combined the methods of throttling and spark timing, but after several months of testing I discarded the throttling valve and have since controlled the engine entirely by retarding or advancing the spark. I was backward in adopting this method, for the reason that drawing in the full charge when the engine is running slowly seemed a sinful waste of gasoline. My own experience taught, however, that despite theory little difference in fuel consumption resulted from the change while far better working results were secured when running under a light load. In such running the spark occurs when the piston has traveled well outward on its impulse stroke. Then the gas has expanded naturally to no mean extent and a soft action results. Also the fire in the cylinder is short lived, which naturally prevents over heating, especially if the cooling system is not the best. On my present carriage I have the sparking device so arranged that when starting or disconnecting the engine the spark occurs when the piston is just a little more than half way out. The impulse will barely make the engine run at a slow speed, and there is practically no noise or vibration.

My machine, like that of most amateurs, had its share of noise and vibration, however, and to get rid of it was not as easy as I had at first thought. The engine itself was unique in many respects. It had two cylinders, side by side, of 3 9-16-inch bore by 4½-inch stroke. Both pistons worked on the same crank but instead of the fly wheel being mounted on the crank shaft as ordinarily, it was carried on a secondary shaft which was driven through spur gears from the crank shaft. This fly wheel gear was 2½ to one and the wheel weighed only 24 pounds. Owing to its speed this fly wheel was fairly satisfactory but as the power was taken from the secondary shaft there was a pronounced groan in the gearing with every power stroke of the piston. Had I been able to take power from the crank shaft I would have probably had a fairly quiet engine. So after I had made a new exhaust valve mechanism, because the old one was slamming and rattling considerably, I also decided to make a new crank shaft with the fly wheel upon it. While doing this I lengthened the stroke to 5 inches and increased the weight of the fly wheel to 96 pounds. The vibration seemed to be about the same as before but the noise of the gear grinding was absent and I had gained in power owing to the longer stroke and higher compression.



The Finished Machine—Unpainted.

My next work was to make a new muffler, which also resulted in improvement. I was careful to make it sufficiently heavy to withstand ignition of gases within it owing to miss-firing in the cylinder. I have noticed on more than one machine that explosions in the mufflers are more or less frequent.

In looking over my running gear I noticed that the location of the motor and the way the springs were attached were in every way favorable to vibration and furthermore prevented flexibility. The frame would not

EDITOR'S NOTE.—This is the conclusion of an article in two parts by Oscar M. Bergstrom, of Minneapolis. The first part was published last week.

yield more than 4 inches to an inequality of the road, and more than once I have ridden with only three wheels on the road while the other hung in the air. Seeing no chance for improvement in the old one, I made a complete new running gear. This was so flexible that any of the four wheels might be tilted 18 inches from ground or two diagonally opposite wheels each ten inches from ground. This gear was made of tubing and cost me considerable money and work, but it is a pleasure to realize that one has a first-class article after having endured the other kind for some time. The drive by two chains was retained and is to my mind a good system. There are many advantages in a dead rear axle over the live one, but it is more expensive to make and does not look as neat as the customary single chain drive, which is probably just as satisfactory for lighter vehicles. As for using belts, a failure may be recorded against me. In the Cycle Age in 1898 I read of Duryea and several others having abandoned belts, but nevertheless in my early experiments I thought I could make a success of it. Like other men I was unwilling to be guided by experience of others. Belts will do the work in a fashion but not as satisfactory as a first-class clutch mechanism. I made and now use a transmission device that has no gears in motion on either high or low speed, but only in reverse driving.

When I bought the rig I promised to bring it back and show it to its original owner when I had finished fixing it up—and I will. Should I take it back now all I would have to show of what I bought for $100 would be the outer casing of the rear tires, the spokes, rims and hub shell of the front wheels, and the cylinder shell and pistons of the engine. When I do take it back there will be only the wheel parts mentioned to show as I have now started to make a new engine. The engine I have now is able to pull this 700 pound rig along at 24 miles an hour on good roads and to climb any hill in this vicinity but the machine is fitted with ball-bearings everywhere except engine, even to the steering post.

In concluding my story I have a few words of advice for those readers who are on the threshold of amateur automobile building.

Do not start to make an automobile unless you have plenty of money. The better way is to buy a low priced machine, popular make. You doubtless figure that you will spend just a certain amount of money and that your labor costs you nothing, but you will be surprised to learn how quickly the money will leave you. Do not start unless you are a good mechanic, or can get the assistance of a good machinist. A man "handy" with tools does not answer the purpose at all. Do not try to make a cheap rig. Get the best there is of everything and buy nothing that has not been tested in every way.

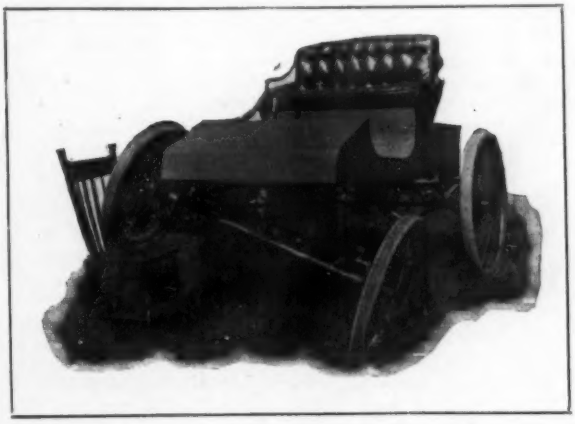
When buying an engine do not buy one with so light a fly wheel that will not make at least 40 revolutions after the ignition is cut out. That is, if you start the engine and let it run at its ordinary speed, then let it draw in the full charge and cut out the ignition, it ought to run at least 40 revolutions before stopping. I have seen engines with the fly wheel inside of the crank case that would stop after missing only two or three explosions. Such engines are not, in my opinion, satisfactory. There will always be times when the engine will miss fire and that is the time you will need the heavy fly wheel.

Do not believe that you can build an automobile that will "beat all the rest to pieces." Remember that there are manufacturers who have had years of experience behind them. Do not believe every article you read about the gentleman who has built a successful automobile at the first attempt; should you follow him home and see him tinker away at the rig every time he takes it out you will agree with me that the truth is not always in such statements. All a successful carriage needs is proper oiling and filling up of tanks to permit starting, and before you can produce such a rig you will need a good deal of experience in automobile building.

Do not be satisfied with buying some of the most essential parts and making makeshift devices for the rest. If you do you will feel cheap and dissatisfied when some of the really practical vehicles pass by you while you are trying to make yours go, and while the small boys are poking fun at you. Do not believe you can make one in just a few weeks. Do not invite all your friends to see you take your first ride. It is better to take this trip early in the morning while your neighbors are asleep. Do not start at all until you have studied and deliberated carefully upon the subject. Buy some of the best books that treat the topic from every standpoint and study these closely.

You may, in reply to my advice, offer the objection that I may not be in a position to advise others because all I have done is to rebuild an automobile. This is true only to a degree; in reality I bought a complete running gear, engine and transmission, all of which proved unsatisfactory or no good. If you are not careful in selecting parts you may get into the same fix. Besides this I have followed the progress in automobile building of six or seven other mechanics, and I am sorry to say that their machines have all been failures, owing particularly to the following causes: Poor workmanship, makeshifts for vital parts, inability to judge requirements of certain parts, lack of patience to carry it through until final success has been attained and lack of money.

My own rig would have been a complete failure had I not been a good mechanic with several years' experience in die and tool-making and three years' experience in a patent developing shop. There I learned that anything can be made a success if followed up persistently and everlastingly. In that shop I cultivated perseverance, and I feel sure that when my new engine is made I will have a really practical automobile. I will then sell it, and with the money will start to make another with still more improvements. Improvements are borne by experience, experimenting and careful study.



Showing Flexibility of Running Gear.

If you are willing to buy first class parts, suitable for the class of carriage you intend to build, you will no doubt eventually meet with success if the workmanship is first-class. Such parts may seem outrageously high in price to you, but if you start to make them you will learn that such is not the case.

CLEVELAND WANTS A SHOW

Local Exhibition Occurring Between New York and Chicago Events Planned—Doings in the Trade.

Cleveland, Nov. 24.—There is a strong probability that Cleveland will have an automobile show between the New York and Chicago events this winter. Several of the leading dealers have formed for this purpose an association known as the Cleveland Automobile Association. No public announcement has been made, and the matter has not been absolutely decided, and will not be until the leading manufacturers have been canvassed for their views regarding such an exhibit. The difficulty is that the National Association of Automobile Manufacturers, including nearly all the leading makers, has declared against any shows other than those of New York and Chicago. The Cleveland dealers contend that their show will be in the nature of a local affair, and if the manufacturers can be induced to exhibit through their local agents there can be no objection from the National Association.

It is claimed that Cleveland is peculiarly well adapted for a first-class automobile show. This city is recognized as the center of the automobile industry, and even if the exhibit was confined to the Cleveland manufacturers, the show would be a fairly important one. Added to these the manufacturers within a radius of 50 miles, it is claimed, the list would include nearly half of the manufacturers in the country. The expense of shipping and time lost would be much less than with either New York or Chicago, and there would be the added advantage that any interested parties could be taken to the factories and shown how the machines were built. By holding the event between the New York and Chicago shows the manufacturers from distant portions of the country could stop off in Cleveland with but small increased expense.

George Collister, one of the prime movers in the affair, states that the manufacturers with whom he has talked are enthusiastic over the idea. The plan is to secure the Gray's Armory, in which was held one of the most successful local bicycle shows ever given, and to have a four or five days' exhibit. In case the manufacturers decide against a local show of this kind, it is the plan to later hold an automobile opening week, similar to the opening weeks held by the bicycle dealers in past years.

The Geneva Automobile and Mfg. Co. stands a good chance of closing a foreign order for 500 steam automobiles. An English agent visited the Geneva factory lately and was so impressed with the Geneva machine and the company's facilities for turning out goods that it seems quite probable that the order will be placed. The Geneva company has already shipped a number of cars to foreign countries, and if an order of the size mentioned is closed it will be one of the largest, if not the largest, foreign contract ever taken by an American manufacturer.

The Berg Automobile Co., whose headquarters are in New York, has recognized the importance of Cleveland as a center of material and manufacturing facilities by coming to this city to get its machines built. The Berg company is occupying a portion of the factory of the Cleveland Automatic Machine Co., and is completing several styles of machines patterned after French models. One of them will be a large four cylinder touring car, and another a two cylinder machine. Hart O. Berg, of the company, was formerly with the Electric Vehicle Co., and some time ago he went to France and made a careful study of French gasoline cars. Recently he returned to this country with models and parts for producing machines of the French pattern. It is probable that the factory will ultimately be located in this city.

The General Automobile and Mfg. Co. is fully settled in the factory building which it acquired some time ago. It is winding up the last of its 1902 product, and completing models of the 1903 pattern. For the coming year the company will build a 14 horse-power vertical double-cylinder machine in addition to the runabout which it built this year. Last week the company placed an order for new machinery and this will be placed in operation as soon as possible. It is thought that the output will be brought up to one machine a day, and later this may be increased to two machines a day.

The presence in this city last week of George P. Day, of the Electric Vehicle Co., accompanied by several leading New York attorneys gave rise to the story that important developments may be expected in connection with the Seldon patent on the use of gasoline engines in connection with automobiles. As is well known, the Electric Vehicle Co. owns this patent and has brought suit for an accounting against several of the leading manufacturers of gasoline vehicles. A prominent maker of this city intimated to the writer that while he had not been approached on the subject, he understood that the owners of the patent were endeavoring to compromise with two or three of the most important manufacturers with a view of thus bringing the others into line.

Secretary Brown, of the Winton Motor Carriage Co., denied having seen the eastern gentleman, and stated that so far as he knew no proposition had been made to settle the Seldon patent case. He stated that the suit against his company was still before the courts, and he believed testimony was being taken. He thought it would ultimately be brought to trial and declined to venture an opinion as to the probable outcome.

Architects for the new retail establishment of the Cleveland Automobile and Supply Co. have completed their plans, and work on the building will start as soon as possible. The plan is to overhaul and rebuild the old music hall, which was partially destroyed by fire several years ago. The building is 152 by 75 feet, and will have two floors and basement. There will be an inclined entrance for automobiles from the front. The basement will be used for general storage of material, and there will be an elevator sufficiently strong to take the heaviest vehicle to the second floor. The basement will have a cement floor, and the cleaning of vehicles will be done here. In the front portion of the ground floor will be the office. In the rear of this will be the repository or salesroom, with space for about 20 vehicles. Back of this will be a storage room, and in the extreme rear the repair shop. There will also be a sleeping room for the night men, and adjoining this a toilet room. On the second floor will be a club room that will be leased to some club or utilized as a waiting

room for customers. Back of this will be a large storage room. In all the company will have space for nearly 200 vehicles.

The Diamond Rubber Co., of Akron, is preparing to open a branch store and repair shop in this city. It will be in charge of F. E. Tayloran, an old-timer in the bicycle trade.

Remington Future Bright.

Those directly interested in the affairs of the Remington Automobile Co., of Utica, N. Y., met last week to discuss the future status of the company. Conditions will be found to be much more favorable than had been supposed and it is probable that a complete reorganization will be effected within a short time. The outlook for business is good, there being many orders for motors and carriages on hand. A committee on reorganization was appointed to give the matter attention at once.

Fish Company to Sell Solid Rubber Tires.

Recognizing a constant demand for solid rubber tires, and its factory being taxed to the utmost on Fisk bicycle and automobile tires, the Fisk Rubber Co. has completed arrangements to represent exclusively the Firestone Tire & Rubber Co. in the cities of Springfield, Mass.; Syracuse, Buffalo and Detroit, where it has branches, and is prepared to quote prices, deliver and attach the Firestone side-wire solid tires. In selecting a solid tire of another make, the Fisk company believes results in the past justify the adoption of the Firestone and that it can, by handling this tire, not only better meet the varied needs of customers but also increase the business without sacrificing anything in the pneumatic line.

Found—E. J. Pennington.

It is announced that the plant of the Racine Boat Mfg. Co., of Racine, has been sold for $300,000 to the American Automobile Co., which was recently incorporated for $500,000. According to newspaper reports this capital is to be increased to $5,000,000 and the concern is to endeavor to build 100 automobiles per week. Then comes the information that among the directors is the long lost E. J. Pennington, who has scalped clouds and small investors with flying machines, jumped material and financial ditches with motor bicycles and planned numerous wonderful automobile enterprises. It is to be sincerely hoped, if the report is true, that the other directors are as well posted in company organization as Mr. Pennington.

New Home, Better Facilities.

The Beardsley & Hubbs Co., of Shelby, O., has been reorganized under the name of the Shelby Motor Car Co., for the purpose of extending its business and increasing its facilities. About $50,000 additional stock will be sold and the working force of the factory will be doubled. It will then be able to turn out three or more complete machines per week.

Melange of Trade Brevities

An automobile storage house and repair shop is being erected for the Bornot Bros., of Philadelphia.

The Cadillac Automobile Co., of Detroit, has increased its capital from $60,000 to $300,000.

The Orange Automobile Co., of East Orange, N. J., has been incorporated with a capital of $100,000.

The National Automobile Co., of Oskosh, Wis., has added a French type of touring car to its line of machines.

The Autocar Co., of Ardmore, Pa., is doubling the size of its factory by the erection of a large three-story addition.

The Clark Co., of Lansing, Mich., has completed its first gasoline vehicle and hopes to be ready to make an exhibit at the Chicago show.

The Haynes-Apperson Co., of Kokomo, Ind., announces that by the first of the year it will be able to produce a vehicle a day.

A New York state association of automobile clubs is projected. The purpose is to keep a close eye on state legislation at Albany.

The Nichols Kerosene Motor Co., of New York, to manufacture kerosene motors, has been incorporated with a capital of $1,000,000.

The Northwestern Motor Vehicle Co. has taken the agency for the Autocar in Minneapolis and has already received samples of the 1903 model.

The Macks, Slay Co., of North Grand Rapids, Mich., has been attracted by the automobile business and will commence the manufacture of bodies.

The Hawkins Automobile and Gas Engine Co., of Houston, Tex., has been incorporated with a capital of $20,000. The purpose is to handle automobiles and accessories.

William Hibbard, formerly of the Chicago branch of the Locomobile Co. of America, has been engaged by the Studebaker Bros. Mfg. Co. to take care of the Chicago business.

The new works of the Pennsylvania Rubber Co., of Pittsburg, are nearly complete and within a couple of weeks it is expected that altogether over 1,000 employees will be at work.

The newly organized Rubber Mfg. Co. will erect a large factory in Milwaukee for the purpose of producing rubber tires for automobiles and other vehicles. The company will be independent of the rubber tire combination.

The Chaney Automobile Transportation and Storage Co., of Terre Haute, Ind., has been incorporated with a capital of $10,000. The immediate purpose is to establish a large automobile agency, but for next season plans are being laid to establish an automobile transportation line.

The Waterloo Motor Works, of Waterloo, Iowa, has been incorporated for the manufacturing of automobiles and gasoline engines, with a capital of $200,000, of which $150,000 is paid in. C. E. Duyrea has arranged with this company to manufacture vehicles of the Duryea type.

The Lansing Automobile Body Co., of Lansing, Mich., is at present devoting its entire capacity to the production of bodies for the Oldsmobile and Rambler. A few are also produced for the Stearns company of Cleveland. H. E. Bradner, of the company, paid a visit to the Rambler company at Kenosha last week.

Spokane, Wash., is to have an automobile garage. It is being planned by Fred T. Merrill, well known in connection with the Merrill Cycle Co., and by C. W. Smith, the manager of the Merrill company's store in Spokane. The garage will include agencies for several prominent machines, as well as the business of storing and repairing.

The Jarvis Engine Machine Co., of Lansing, Mich., has been making a low water alarm for steam carriages, but does not find it sufficiently profitable to make it a specialty for the automobile trade. The company is building half a dozen runabouts on special orders and may, in due course, organize a special plant for that department of the business.

Current Information for Buyers

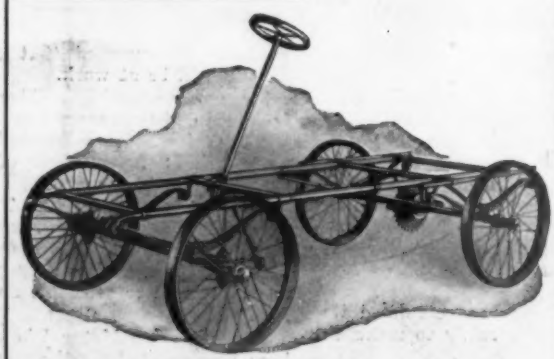
Creditable Steam Showing.

The good work that is being done by some of the steam vehicle manufacturers in advertising steam as a motive power is exemplified in the new catalogue of the Lane Motor Vehicle Co., of Poughkeepsie, N. Y. The company devotes two pages to the awards in the various contests which have been held in the past year. These tables show that in the New York-Rochester contest of the light vehicles 31.9 per cent of the steamers won first-class certificates, as against 16.6 per cent of gasoline machines. In the Long Island contest the blue ribbon winners were represented by 37.5 per cent of the steamers as against 30 per cent of gasoline machines. In the A. C. A. non-stop contest steam is credited with 73.3 per cent as against 43.3 per cent for gasoline. The result of the New York-Boston run is given as 42.1 per cent for steam and 16.3 per cent for gasoline.

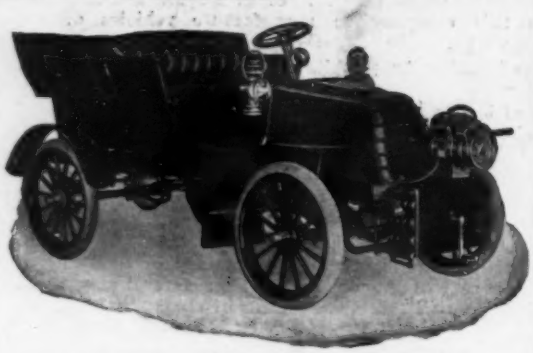
Westfield Bodies and Running Gears.

Probably one of the widest range of models in an automobile running gear and body line is in that produced by the C. J. Moore Mfg. Co., of Westfield, Mass. The Moore company furnishes complete automobiles ready for power. The machines are entirely finished, including painting, upholstery, hoods, brakes, special motor hangings and tires, if desired. And these vehicles are produced in a range of models which suffices for the building of steam and gasoline vehicles in sizes from a light runabout to a heavy touring car. Of course the machines can be obtained unfinished, or any part of them for that matter.

Two of the popular complete sets are shown in the accompanying illustration, together with one of the running gears. This gear is a modern affair having the rectangular tubular frame which is now well liked by the makers and the style of springs which have proven most generally satisfactory for all around use in moderate weight cars. A similar gear of longer wheel base, with larger wheels and of somewhat heavier construction is offered for touring cars. A third running gear of the tubular reach type with full elliptical springs in the rear and a semi-elliptical cross spring in front, is supplied for runabout and other light vehicle construction.



Tubular Running Gear.



Touring Car.

In bodies French patterns are offered for light as well as for the heavier cars, while there is also a line of

Runabout.

bodies with closed and folding box fronts for steam machines and for gasoline machines in which the motor is disposed under the seat. Motor bonnets of several different styles are carried in stock and special patterns will be made to order. In the company's recently issued catalogue the principal styles of complete machines are illustrated. The company aims to keep all of these models in stock or, at least, ready for assembling, so that orders can be promptly filled. Orders necessitating radical changes from regular construction require about a month's time for filling. The machines and parts are all guaranteed to be free from mechanical defects. Brandenburg Bros. & Alliger, of New York and Chicago, act as selling agents for the Moore Company.

Two New Spark Plugs.

A. W. King, of Maywood-Hackensack, N. J., who is well known to the trade as a mechanical engineer and designer of considerable experience in automobile work, is now introducing two spark plugs, each of which is unique in construction.

The Non-Stop plug was designed to eliminate the necessity for removal of the plug while on the road, for ridding it of any foreign matter which might form a bridge from one terminal to the other, rendering the plug inefficient. The insulated terminal of this plug possesses a protecting chamber which at the same time constitutes the opposed or grounded terminal. The sharp edges of the button-shaped inner terminal are located at an equal distance all around from the interior wall of the surrounding chamber, leaving but a 3-64-

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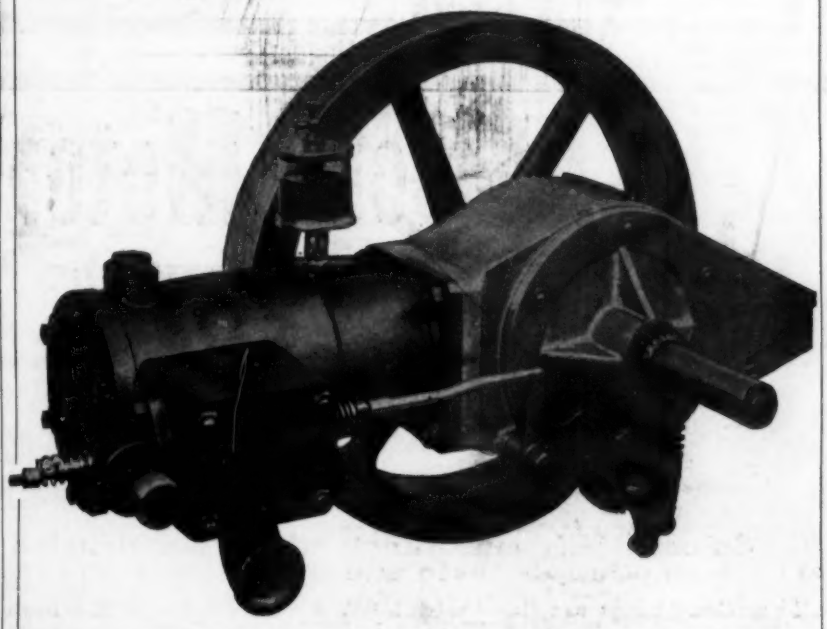

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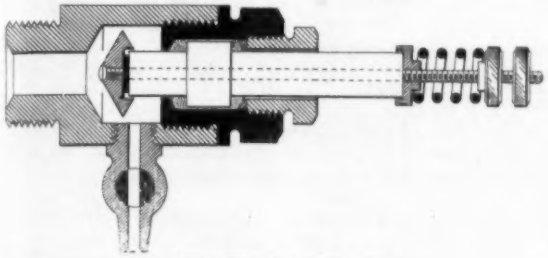
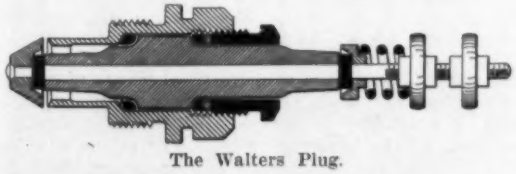
inch space, this having been found the most suitable for the production of a good spark. All plugs have commonly had to be removed from the engine for cleaning or exchange, when bridging of the two terminals has taken place. Should bridging ever occur in this new spark plug, it is but required to open the vent cock



The Non-Stop Plug.

attached to the chamber, when the contents of the cylinder are forced through the spark-gap to the exclusion of any other passage, tearing loose and ejecting through the opening of vent cock, any obstacle which may have lodged between the terminals. The engine need not stop for a moment while the spark-plug is being blown out in this manner. The same vent-cock should be employed as a compression relief cock, to insure clean terminals from the start and without recourse to any other means. A pressure of from 60 to 90 pounds per square inch—this being the usual compression in gasoline engines—is a most efficient means for clearing away obstructions from between terminals. When it is desired to remove the inner terminal, the chamber with the vent cock may remain on the engine and the inner terminal alone detached.

The Walter spark plug belongs to that class of plugs wherein the insulated terminal is disposed axially with the holder of the insulator and the holder itself serves as the opposed terminal. The tendency of small terminal wires to rapidly become coated with a deposit of oil soot or the still harder carbonaceus matter resulting from the baking together of alternate layers of soot and oil, is well known to users of some of the common forms of spark plugs. When a deposit has formed sufficient to bridge the small gap between the two wires, the electric current naturally finds the shortest path—through the bridge—and there is no sparking and consequently no ignition of the charge within the cylinder. The Walter spark plug is the direct outcome of an endeavor on the part of the inventor to do away with this difficulty. The central terminal consists of a circular, inverted cup shaped piece of metal. It measures nearly two inches in circumference and is termed by its maker a "mushroom" terminal. Directly opposed to the sharp edges of this circular inner terminal is located an annular metallic body integral with the holder of insulator. The latter is made from the best grade of dense porcelain with a burned-in glaze. Where two terminals



The Walters Plug.

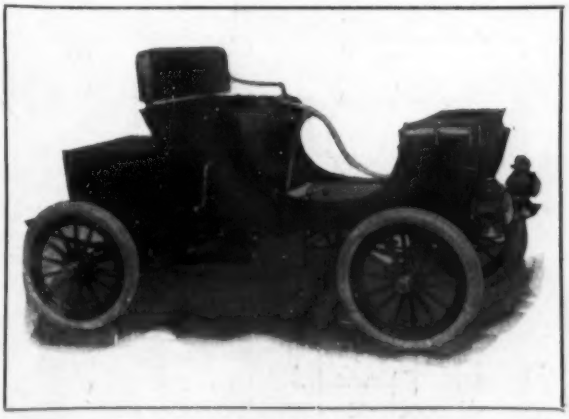
of about two inches of efficient sparking surface, are opposed to each other, the coating of even one-half of these surfaces with oil or other deposits, will not affect the formation of a spark. Another important point in the Walter plug consists of the relatively large proportions of the two terminals. They retain during operation a certain amount of heat, tending to cause any oil which might reach them to rapidly vaporize and be consumed during the following combustion of the regular charge within the cylinder. This is the chief reason for the ease with which both terminals are said to keep themselves clean.

New Century Gasoline Car.

A new gasoline car which will be placed on the market this season by the Century Motor Vehicle Co., of Syracuse, N. Y., gives promise of proving a popular vehicle. It will list at $700 and gives the appearance of being a much higher priced car. The motor is a single cylinder, water cooled, 7 horsepower engine with a new style of carbureter and a planitary gear transmission with two speeds forward and reverse. The car, which will seat four persons, has a double angle steel frame with a wheel base of six feet. Wooden wheels are used with 3-inch detachable tires. Manager Elliott says the company is receiving applications for agencies from all over the country.

Praise for Salamandrine Boiler.

Joseph W. Jones, mechanical engineer and the inventor of the Jones speedometer, has for some months been testing the Salamandrine boiler in his steam carriage. He sent the manufacturers of the boiler last week the results of his experience. He says, in part: "At times I have run out of water without knowing



The Century Gasoline Carriage.

that the tank was empty and continued with the throttle open until the car came to a stop; when the burner was turned off the boiler tubes were red hot. This is a very severe test for any boiler and would completely ruin the ordinary fire tube boiler, to say nothing of the possible danger of an explosion. Another advantage with a boiler of this kind is that any degree of boiler pressure may be carried with perfect safety. Also the rapid circulation of water through the boiler tubes effectually prevents incrustation or corrosion in the boiler. The small amount of water in the boiler at any one time is quickly heated to the temperature of evaporization, making the boiler very quick to respond to the demand made upon it by the engine, and avoids having to wait for steam on steep hills."

The Shelby Steel Tube Co., whose general sales offices are in Pittsburg, Pa., has just issued a new list of all of its tube products. It specifies the exact dimensions, weights, etc., of the different sizes and kinds, contains much tabular information useful in figuring upon such matters, and the most recent schedule of prices.

50-VOLT ELECTRIC AUTOMOBILE MOTOR

PART 2.

Figure 4 shows in detail the construction of the armature shaft of the motor; also of the bronze end plates and the cones and cups for the shaft, and of the brush holders, spring pressure fingers, washers, end caps, field coil clips and the insulation for the brush holders.

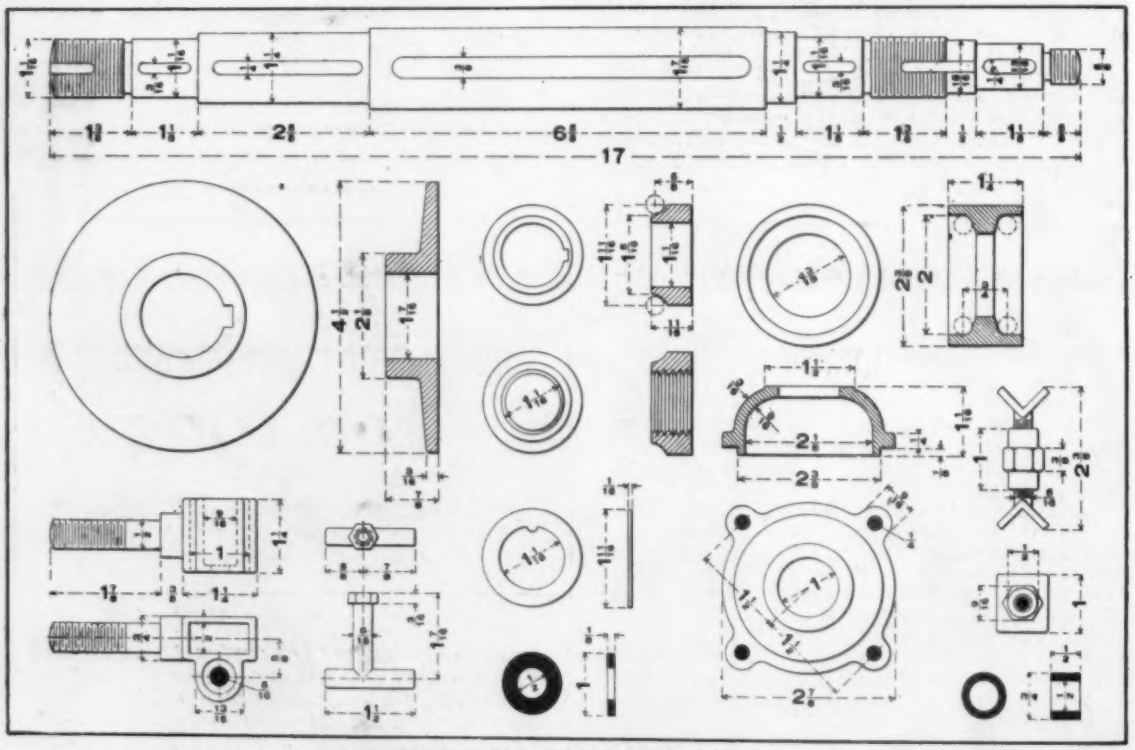
The armature shaft should be turned from 1½-inch Bessemer steel to the dimensions given in the illustration. The keyway in the 13-16-inch portion of the right end of the shaft is ¼-inch wide and ⅛-inch deep. In the 1 1-16-inch threaded portion of the shaft the grooves shown are to be milled with a 3-16-inch, half-round milling cutter. These grooves are for the lugs on the washers that are placed between the threaded bearing cones and their lock nuts.

The two bronze end plates, whose construction is plainly shown, should be bored out to 1 7-16 inches diameter. A keyway ⅜ by ⅛-inch should be cut in the hub. Only the flat face of the plates and the outer edge of the flanges need be finished.

Five-sixteenth-inch balls are used in the end bearing cup and cone raceways. Four cones are required, of which two are stationary and have plain 1 1-16-inch center holes with 3-16 by 3-32-inch keyways. The other two have 1 1-16-inch by 18 threaded holes, but no keyways. All of the cones are to be made from 1¾-inch annealed tool steel and afterward case hardened. The double race cups are to be made from 2½-inch machinery steel, case hardened.

Bronze should be the material used for the brush holders. These have ½-inch by 12 threaded ends. The slots for the reception of the carbon brushes are ⅜ by 1-inch and should be filed out square with the stem and perfectly smooth. The spring pressure fingers that are used to hold the carbon brushes against the commutator are also of bronze and have for shoulders ¼-inch by 20 threaded hexagon nuts. The springs that surround these fingers are made of No. 20 or 22 piano wire and are coiled to ⅜-inch, outside diameter. In Fig. 3—published with the previous installment of this article—is clearly shown the general arrangement of the brush holders, springs and pressure fingers.

The washers for use between the armature shaft bearing adjusting cones and their respective lock nuts, are to be made of 1⅝-inch steel turned to 1 11-16 inches in diameter. After being cut off from the bar each washer can be held on the face plate of a lathe and bored out to have a ⅜-inch eccentric hole. Then by filing, the hole may be enlarged to its full diameter, leaving the tit or lug which engages the shaft groove and prevents rotation of the washer, and hence of the adjusting cone when the lock nut is screwed home.



50-VOLT ELECTRIC MOTOR—FIG. 4.

Aluminoid is employed for the dust caps, of which two are required. One, as shown, is provided with a central opening for the passage of the extension or driving end of the armature shaft. The other is without an opening. In the former the aperture, which is 1 inch in diameter, should be bored at the same time that the flange and shoulder of the cap are faced; insuring accurate concentricity.

The clips that are used to hold the field coils in their proper positions are made of bronze. Each consists of three pieces; one turn buckle with right and left hand

EDITOR'S NOTE.—This is the second installment of a continued article begun last week. Drawings of the assembled motor accompanied the first installment,

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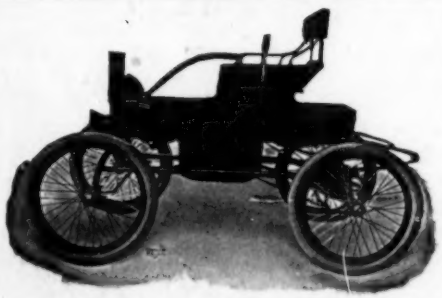

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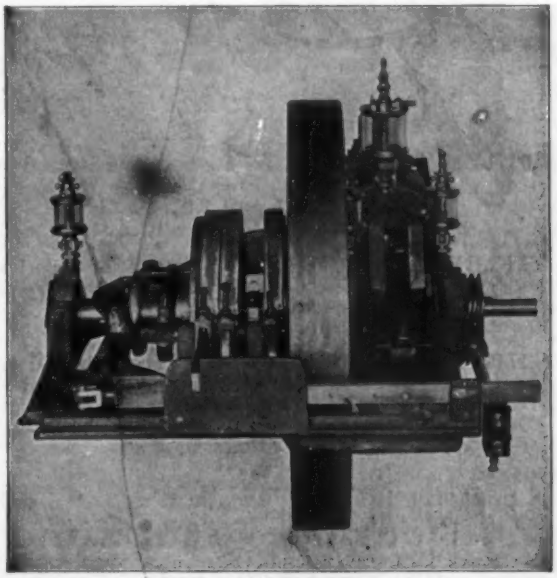

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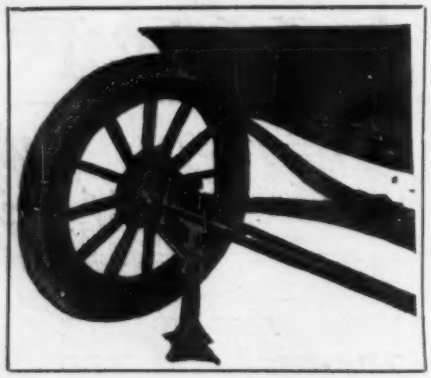

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threads, and two spreaders with correspondingly right and left hand threaded ends. The threads are 5-16-inch by 18.

The shapes and dimensions of the various fiber or hard rubber insulating bushings and washers are clearly presented in the illustration. The dust caps over the end cover bearing hubs are held in position by No. 14 by 20 philister head screws, four to each cap.

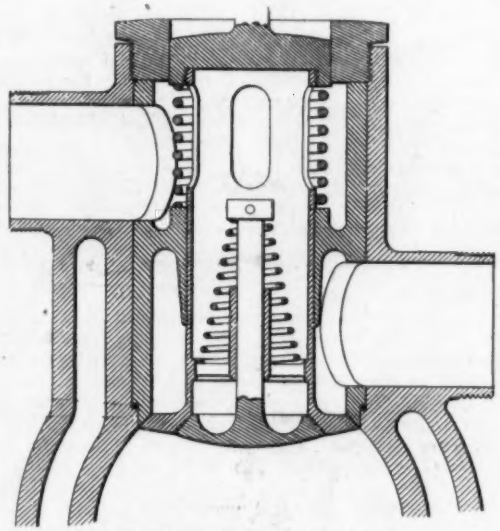
The construction of the end covers and of the magnet frame will be taken up in the next installment.

(To be continued.)

Selections from Recent Patents.

No. 713,058, to Robert D. Camp, of Chicago, Ill., assignor to the Moffett Bearing Co., of Countil Bluffs, Ia., covers the well-known Moffett bearing as adapted to road vehicles. The particular type specified is the end-thrust bearing.

No. 713,147, to William M. Power, of Montclair, N. J., assignor to the Pan-American Motor Co., of New York. The subject of this patent is what may be termed a combined admission and exhaust valve for hydro-carbon motors. It is of that type wherein the inlet valve is



Combined Inlet and Exhaust Valve.

located in and forms a part of the exhaust valve. The point claimed is simplicity, as by the removal of a single locking collar the entire mechanism of both valves may be removed from the cylinder. The construction is plainly shown in the accompanying illustration from which it may be seen that both valves are included in a cylindrical casing which is within a cylindrical chamber in the cylinder head, the lower end resting against a shoulder formed for that purpose, and the upper end secured by a lock-nut. The exhaust valve is operated by a rocker arm on top of the cylinder and the inlet valve acts automatically within the tubular stem of the exhaust valve.

No. 713,313, to Alvaro S. Krotz, of Springfield, O., assignor of one-half to Paul A. Staley, of the same place, covers a method of power transmission for automobiles. The equalizing gear is located adjacent to one of the wheels and the motor is so located that the power is applied directly to the equalizing gear through the medium of a shaft rendered flexible by a pair of knuckle joints.

The motor end of the shaft is journaled in a suitable bearing secured to or in rigid relation with the motor, and the other end is journaled in a bearing connected with the rear axle in such a manner as to retain the gears on the shaft and on the equalizing gear in their correct relative position.

No. 713,536, to John L. Tobias and Charles J. Tobias, of Chicago, Ill., covers a muffler which comprises a cylindrical shell provided with a series of small apertures grouped on one side and near one end of the shell; circular walls or heads for this shell; a pipe passing longitudinally through the shell and held in place by a bushing at one end and by a cap at the other, both of which are screw threaded onto the pipe. The pipe is provided with a series of apertures located at the end opposite the apertures in the outer shell.

No. 713,467, to Donald Macdonald, of Orroroo, Australia, covers a driving mechanism for motor cycles that comprises a somewhat complicated system of gearing contained in a cylindrical case which is preferably located in the driving wheel and may be provided with spoke flanges, thus rendering it the hub of the wheel. The device comprises a spring seated sprocket, to be used in connection with a chain as the medium between the motor and road wheel; a clutch whereby either motor or pedals may be disconnected from driving connection with the road wheel, and a back pedaling brake. The only readily apparent objection to the device is its complication, the mechanism including several sets of planetary gears and a number of ball bearings.

No. 713,533, to Frederick Thourot, of New York, covers a clutch device for motor cycles whereby the motor may be disconnected from driving connection with the road wheel. The apparatus is in the nature of an expansible ring clutch and is designed to be applied to a counter shaft secured to the seat mast of the frame. On this shaft are two sprockets or pulleys, one of which is connected with the motor and the other with the road wheel, the former being secured to the shaft, which is tubular, and the latter to a rod passing through the shaft.

Charging and Care of a Storage Battery.

To charge a two or three cell storage battery from a 110 volt light circuit, connect one 16 or two 32 candle power lamps in series, with one of the wires leading from the wall socket to the battery, thus making a complete circuit through the lamps and battery to the light circuit.

To ascertain which is the positive and which the negative wires of the light circuit place the ends of both wires in a glass of water, to which a few drops of sulphuric acid or a teaspoonful of malt vinegar has been added. Switch on the current and bubbles will rise from the ends of the wires—quickly from one wire and very slowly from the other. The wire from which the bubbles rise quickly is the negative and the other consequently the positive. Connect the negative wire of the light circuit to the negative pole of the battery, and the positive wire to the positive pole of the battery. Allow the battery to charge at least eight hours; ten hours is better in most cases.

When the electrolyte, or liquid which is used in a storage battery, falls below the level of the plates by reason of evaporation the cells should be filled with clean, soft water, or with distilled water if possible. Any further addition of sulphuric acid is entirely unnecessary as it does not evaporate, and any addition of battery solution already mixed would tend to increase the strength or density of the electrolyte and result in injury to the plates.

Care should be taken never to allow the solution to get beyond ¼ or ⅜ of an inch below the top of the plates, as it may cause them to buckle.

TO POOL CYCLE MANUFACTURING

Endeavor to Organize Association for the Purpose of Regulating Production and Prices.

Cleveland, O., Nov. 24.—Among the bicycle dealers, supply men, and others outside the pale of manufacturers there is considerable difference of opinion as to the true significance of the meeting of bicycle manufacturers held at the Hollenden Hotel in this city last Friday. Representatives of fifteen of the leading manufacturers, including the American Cycle Mfg. Co., were present at the meeting, which was held behind closed doors. It was announced that the meeting was an adjournment of a meeting which had been held in New York a week before, and that on account of unsatisfactory representation it had been postponed to be held later at the more central point. It was stated that the chief object of the meeting was to come to an agreement on standard designs and uniform prices. George N. Pierce, of the George N. Pierce Co., of Buffalo, presided at the session and E. E. Jackson, a New York attorney was secretary.

The delegates to the meeting declined to give out anything for publication, either before or after the session, and newspaper men were referred to Mr. Jackson. Prior to the session Mr. Jackson said:

"The meeting was called for the purpose of correcting many gross abuses in the bicycle trade, that if allowed to continue will throttle the business. One of these is the tendency to flood the market with a thousand different kinds of models. A number of firms have been in the habit of putting out a series of models, some of which vary only in the color of enamel. The result has been a tremendous expense that has come to be little more than folly. The hope is to reduce the number of models fully one-half. Another great evil is that of discounts. The discounts and terms now granted are suicidal. This question must be met and discounts put upon a business-like basis.

"Prices will not be raised at present, at least. It would be absolutely impossible to raise prices before July 1, if it was so desired. This is because the great bulk of the bicycle business is by contract and the contracts for next season have all been made and probably three-fourths of all the machines have been sold. These contracts do not expire until July 1. After that time a move will be made to increase prices somewhat. A popular opinion seems to prevail that the bicycle business is dead, but figures show that last year over 600,000 bicycles were sold in this country, with a value of between $11,000,000 and $12,000,000, and yet the business is so demoralized that, comparatively speaking, not a cent is being made.

"The bulk of the business done during the past two or three years has been in the cheapest kinds of bicycles. The trade has been almost entirely with the farmers and working classes, and practically no high grade bicycles were sold.

"It will be the aim of the new manufacturers' association to push the high class business. It is believed that high grade bicycles still represent a splendid business, and the decline in the quality demanded by the trade has been due almost entirely to injudicious business methods. The salvation of many of the leaders in the trade has been the foreign business. The export business has been good, for the reason that once the goods were well introduced the price cut very little figure. The demand from England and Germany has always been for the best class of machines and has been a profitable trade."

The session continued until late in the evening, and after the meeting Secretary Jackson gave out the following statement:

"Our discussion covered a wide range of subjects, and I give you my word of honor that nothing definite was accomplished. However, we have started to work to standardize the business, and in 1904 we will cut the number of patterns of bicycles in two. Our object is to decrease the number of different styles of machines. For instance, we will have uniform $25, $35, $50, and $75 models equipped with the same tires in different makes, etc., according to their grade. The question of prices was discussed, but there was no agreement, and the subject will not be taken up until a meeting to be held in Buffalo next June. However, it is likely that the manufacturers will boost prices at next year's meeting, since the 'trust' and independent manufacturers are working together harmoniously."

The above statements were given in a manner well calculated to satisfy the newsgathering appetites of the daily newspaper men who were sent to "cover" this assignment, but the explanation as to the objects of the meeting were a trifle hazy to a close student of the bicycle industry.

Careful inquiry among those present at the meeting revealed the fact that one or two interesting, although possibly unimportant points had been omitted in Mr. Jackson's carefully worded interview. According to one who is in position to know, the plan for a "manufacturers' association" was evolved by the fertile mind of Arthur L. Garford, president of the Federal Mfg. Co., a leading material concern which supplies both the independents and the American Cycle Mfg. Co. It appears that since the appointing of a receiver for the latter company matters have not been progressing as smoothly as they might. The company has not closed its large jobbing contracts as early as usual, and the independents have been gathering in the orders in an unprecedented manner. It was figured that if the independents could be induced to go into a pool, covering the questions of price and production, a large slice of the business could still be coralled by the big company at prices which would tend to improve matters immensely for its stockholders.

To assist in the plan the services of E. E. Jackson, who is famous throughout New York as a pool attorney, were secured. The independents were invited to join an association for mutual benefit, and the majority of them acquiesced. The questions of standard lines and equipment, rates and discounts, freight rates, and other matters were discussed, and then one at a time the manufacturers were called aside and asked to divulge the amount of business done during the past few years, the idea being that the total production should be pooled and the output prorated aming the various manufacturers at prices which would be standard. The majority of the independents consented to the pooling arrangement, but only on a basis of jobbing output, without consideration of goods sold to retailers. It was estimated that out of a total production of 600,000 bicycles for the coming year about 250,000 would be sold through the jobbers.

After counting "noses" among the independent crowd it was ascertained to the intense disgust of the others that the independents had secured orders from jobbers aggregating about 201,000 bicycles. It was an eye-opener for the independents themselves.

Of course, with such an array of figures for contracts already closed, a pool agreement was out of the question for this season. The independents held a caucus and decided that while they had the upper hand this year it had been expensive for all concerned, since the competition among themselves had been unusually fierce, and that after all the pooling agreement might not be such a bad plan for next season, in view of the probability that the "trust" would not be caught napping another year. Accordingly a "gentleman's agreement"

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was made under which none of the parties concerned are to quote prices for later than June 1, 1903.

In the meantime the pool organizer, Mr. Jackson, is to confer with the various individuals and formulate a plan for standard construction as well as for pooling the output another year. Of course, the pooling arrangement will not go into effect unless it is satisfactory to the leading independent makers.

Those present at the Cleveland meeting were:: Col. A. A. Pope and A. L. Garford, American Cycle Mfg. Co.; Ezra Kirk, Kirk Mfg. Co., Toledo; George N. Pierce, the George N. Pierce Co., Buffalo; Harrison Williams, Waltham Mfg. Co., Waltham, Mass.; E. Julius Lonn, Great Western Mfg. Co., LaPorte, Ind.; Ignatz Schwinn, Arnold, Schwinn & Co., Chicago; G. Frank Freise, Day Mfg. Co., Buffalo; H. E. Maslin, Stearns Bicycle Agency, Syracuse; J. R. Ransom, Snell Cycle Fittings Co., Toledo; F. H. Hoffman, Davis Sewing Machine Co., Dayton, O.; Harry Walburg, Miami Cycle Mfg. Co., Middletown, O.; Roscoe Bean, Bean-Chamberlin Mfg. Co., Hudson, Mich.; Samuel Leonard, Worthington Mfg. Co., Elyria, O.; Homer P. Snyder, Snyder Cycle Works, Little Falls, N. Y.; George Beeber, Wisconsin Wheel Works, Racine, Wis.; F. E. Southward, Toledo Metal Wheel Works, Toledo, O.

Topics of Popular Interest.

Dave H. Morris, of the Automobile Club of America, New York, has returned from a three week's trip to Paris. He noted the large number of electric pleasure vehicles, mostly cab and broughams, and the limousine top automobiles in use. Vehicles under 2,000 pounds and of from 12 to 15 horsepower are most in vogue.

In North Dakota there are many real estate agents and most of these employ automobiles for the purpose of taking the prospective farm purchasers over the prairie acres which are for sale. The roads in North Dakota are smooth, level and hard, and an automobile is extremely useful in covering the great distances which separate the towns.

A London syndicate intends to soon place motor omnibuses upon the streets of London. These are now being built and are of closed construction, with large windows which may be removed in warm weather. The vehicles will have a speed ability of 15 miles an hour. They are intended to compete against the old style London horse drawn bus.

An automobile figured in a large dance one evening last week in the role of leader of the grand march. The occasion was the second annual ball given by the employes of the Haynes-Apperson Co., at Kokomo, Ind. It was held in a large room on the second floor of the new automobile factory building. The terpsichorian automobile was occupied by Mr. and Mrs. Elwood Haynes.

Yonkers, N. Y., that hotbed of anti-automobilism, now has bicycle cops, whose machines are equipped with speedometers. The cyclists follow the motor tourists and when the indicator shows an excess of speed over the legal city limit of eight miles an hour the offender is promptly hauled before Justice Kellog or some other open enemy of the motor vehicle.

Mayor Fleischmann, Chief of Police Deitsch and Inspector Casey, of Cincinnati, are boosting the cause of automobile patrol wagons for the Cincinnati police denual appropriation is presented, it will contain provision nual propriation is presented, it will contain provision for at least three automobiles. The automobiles which are proposed will hold twenty-two persons, as there is much need for large patrol wagons in Cincinnati. Some of the police officials have investigated the merits of the police patrol automobile in Akron and are much pleased with the result.

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WANTED—Second-hand gasoline runabout or parts thereof. Rev. Paul Schmidt, Reeseville, Dodge Co., Wis. 21

FOR SALE—Gear, wire wheels, tires and metal body complete, ready for motor. Also set tubular wheels and front axle. V. Gunderson, 1125 Jefferson Ave., Detroit, Mich. 22

FOR SALE—Haynes-Apperson 1902 Phaeton in perfect order and condition, received in trade; used only short time, about 500 miles. Has extra front reversible seat, with removable front footboard, also extra inner tube tire. Just like all the winners of this make in endurance contest. Cost, $1,600. Price $1,250 on cars. Address P. O. Box 452, Pittsburg, Pa. tf

WANTED—To trade 8-horse power automobile for "Covert Motorette" or Crestmobile. C. Woodruff, 1125 Flora St., Kansas City, Mo. 21

FOR SALE—3 Winton touring cars and 3 Oldsmobiles, taken in trade on 1903 models. Two Haynes-Appersons, 12 Steamers, 3 Motor Bikes, and 20 others. Get our list. Fisher Auto. Co., Indianapolis, Ind. tf

FOR SALE—Waverly Electric Carriage in fine running order, 24-cell Gould battery. Just repainted; black body, yellow running gear. Price $550. W. E. Eldridge, 223 Columbus Ave., Boston. 22

FOR SALE—Seven steam engines 2½x3½; also patterns and chicks for making same. Seven complete running gears, Locomobile style. Cullman Wheel Co., 525 Larrabee Street. 24

FOR SALE—Oldsmobile, full leather top and Dos-a-Dos seat, new from factory in July; guaranteed in every respect; sell cheap. W. E. Rudy, Lima, O. 23

FOR SALE—One Model B Toledo steam car, listed at $1000, perfectly new, for $600. One Toledo Junior, steam, perfectly new, at $500. Wm. E. Metzger, 265 Jefferson Ave., Detroit, Mich. 22

FOR SALE—New Rambler; $560.00. Address Box 567, Spencerville, Ohio. 21

WANTED—Capital to buy out principal in a growing Automobile Company; a bargain. Address INVENTOR, care MOTOR AGE. 22

GUARANTEE No Carbonization

You'll never have to clean it.

NO PORCELAIN TO BE BROKEN.

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"BOUGIE HERZ"

In France, Germany and Austria considered the Best and the ONLY non-carbonizing SPARK PLUG. Price $3.00. Discount in quantities.

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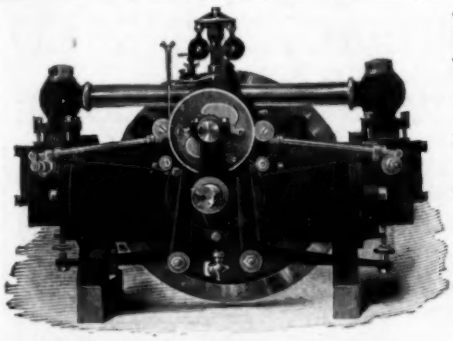

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THE IDEAL GASOLINE ENGINE
***for* LAUNCHES *and* AUTOMOBILES**

New Features. New Results. Automatic Spark Control. Engine controlled by throttle, the same as steam.

ACCESSORIES
Mufflers that muffle. Circulating Pump that does not block circulation when motor is stopped. Magnetos, Spark Coils, Plugs and Batteries.

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It will be in the hands of agents and at our branch depots in a very few weeks. Twenty h. p. motor, new body design, etc. If interested in knowing more, write us.

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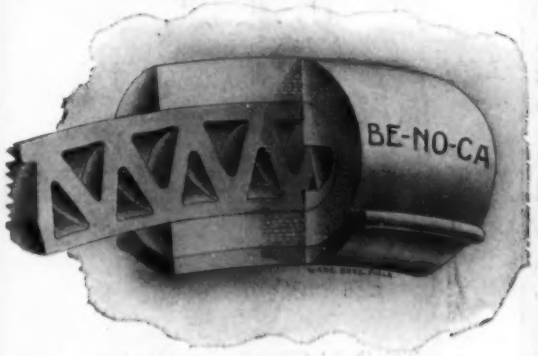

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Faith in one's own product is one of the secrets of success in marketing. We have unqualified faith in THE WOODWARD BURNER. :: It has a record of **Fifteen Miles on One Gallon of Gasoline.** :: Its construction is scientific. Its top plate is flexible and Tubes screw in bottom plate, and if for any cause Tubes have to be removed all that is necessary is a wrench. It makes no carbon. It cannot backfire—absolutely impossible. It makes steam so that even on hills you have enough and to spare. Its flame is blue and twelve inches long, which means that it gives more heat than other burners. It is durable—will last as long as any other part of the vehicle. We guarantee this. :: For proof of any and all claims here made we refer to the boiler itself. :: It will prove them to your satisfaction if you will give it a trial.

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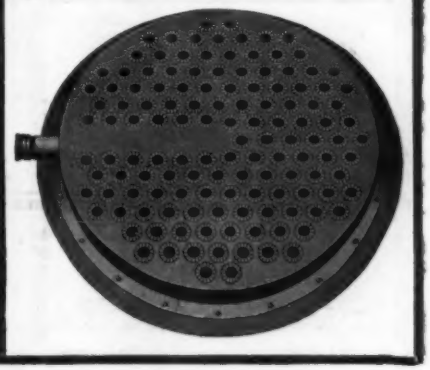

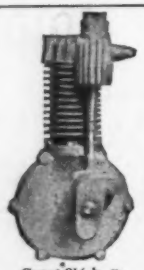

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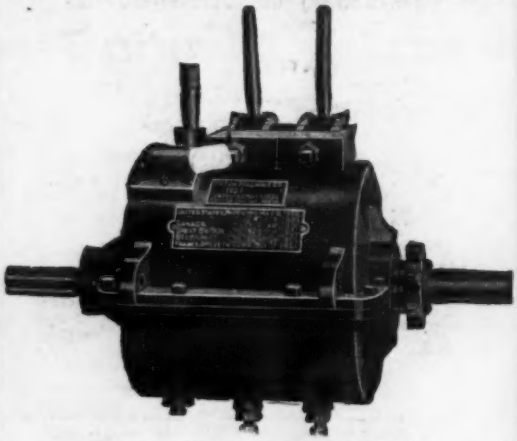

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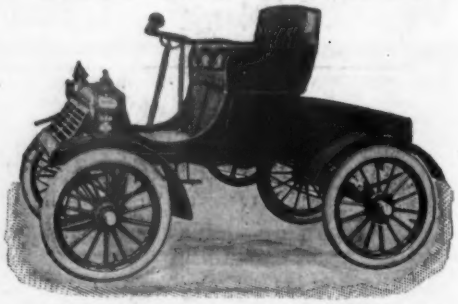

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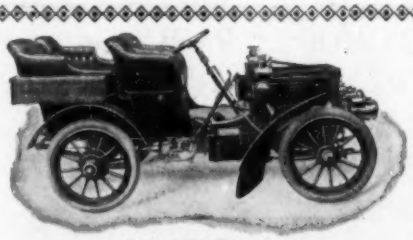

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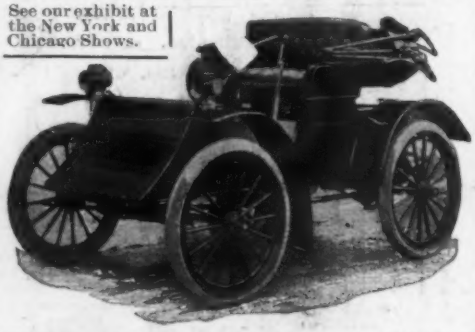

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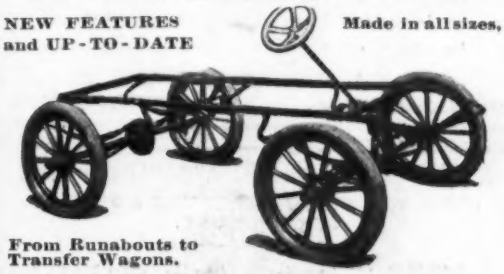

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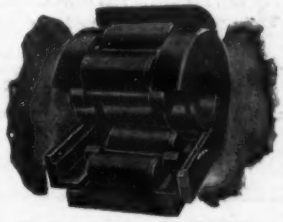

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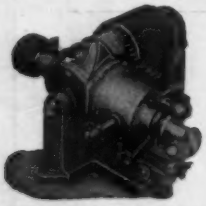

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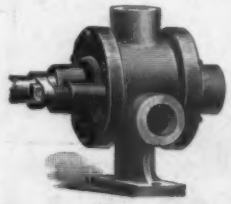

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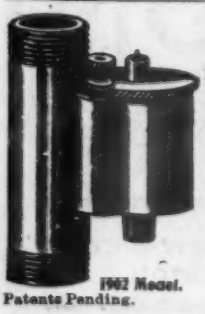

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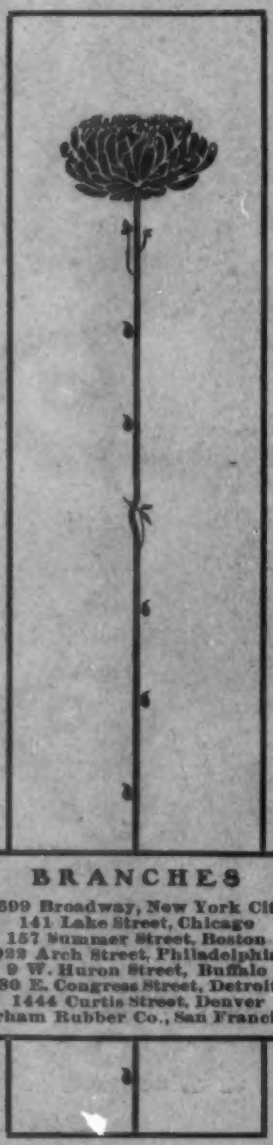

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